

UNDERSEAWARFARE

U. S. S U B M A R I N E S... B E S T S E S T E A L T H M A T T E R S

A Look to the Future

U.S. Submarine Force Gains
Strength and Readiness as
new Technologies and Policies
Come to Bear on the Fleet

INSIDE

USS *Texas* Commissioning

Anti-Torpedo Defense

Special USNA Section

Managing Your Career



4



10



14



29

UNDERSEAWARFARE

THE OFFICIAL MAGAZINE OF THE U.S. SUBMARINE FORCE

A Look to the Future

Features

- 4 | **First Lady Laura Bush Welcomes USS *Texas* to the Fleet**
by Chief Petty Officer 1st Class Barrie Barber, USN

- 7 | **Managing Your Future**
Changing the Submarine Officer Career Path
by Capt. Mark Myers

- 10 | **Anti-Torpedo Defense:**
Defeating a Ubiquitous Threat to Naval Superiority
by David Howard and Scott C. Truver, Ph.D.

- 14 | **A Submariner Brings His Expertise to Afghanistan**
by Commander Naval Submarine Forces Public Affairs

- 18 | **The Naval Academy's Path to the Submarine Community**
by Midn. 1st Class Alexander Ludington, USNA

- 20 | **Q&A: The U.S. Submarine Force**
From the Perspective of Midshipmen
by Mike Smith

- 22 | **From the Fleet to the Yard**
Prior Enlisted Plebes Bring Fleet Experience to the Naval Academy
by Seaman Recruit Matthew Ebarb, USN

- 24 | **Naval Implications of China's Rapidly Developing Nuclear Power Industry**
by Master Chief Petty Officer Shawn Cappelano-Sarver (SS/AW), USN

- 29 | **The Birth of Undersea Warfare – H.L. Hunley**
by John Whipple

Departments

- 1 | Enterprise Watch
2 | Washington Watch
3 | Letters to the Editor
18 | U.S. Naval Academy Special Feature
34 | Downlink

UNDERSEAWARFARE is online at:
<http://www.navy.mil/navydata/cno/n87/mag.html>

On The Cover



Petty Officer 1st Class (SS) Rick Blackman keeps a lookout from the bridge of USS *Florida* (SSGN-728), off the east coast of Florida.

Photo by Chief Petty Officer Kevin Elliott



Well done for 2006. Your efforts and those of your people have made a difference. The Submarine Force and Undersea Enterprise continue to support our nation's combatant commanders with ready forces that provide effective undersea warfare capability.

VADM Chuck L. Munns, USN, Commander, Naval Submarine Forces

Greetings to the Undersea Enterprise. This has been a good year for undersea warfare. We are "On Scene, but Unseen." We continue to operate as a global force, flowing units around the world as needed to serve individually or in concert with US forces and our coalition partners. Our forward deployed SSNs continue to produce information that is useful in the long war and maritime security operations and our SSBNs patrol quietly in a survivable, always-ready posture. Additionally, our Sailors and officers are making important contributions while serving as Individual Augmentees. This year we continued our force transformation in support of the GWOT. Our first two SSGNs, USS *Ohio* (SSGN-726) and USS *Florida* (SSGN-728), and our second *Virginia*-class submarine, USS *Texas* (SSN-775), were delivered. Sadly, USS *Hyman G. Rickover* (SSN-709) and USS *Honolulu* (SSN-718) completed their last deployments. Our last remaining diesel-electric submarine, USS *Dolphin* (AGSS-555), was also decommissioned. Leveraging earlier work with coalition forces, we continued to foster partnerships with capable submariners worldwide. From discrete and persistent scout operations in the littorals to reliable nuclear deterrence at sea, your professional and dedicated service directly contributed to maritime security and world stability.

The Undersea Enterprise continued to mature, align and improve productivity. Your hard work identifying issues and innovative solutions resulted in saving over \$200 million dollars and recovering over 1000 days of submarine operational availability. Five enduring objectives and associated effects served to align results for 2006 and continue to guide the activity of the Enterprise through 2007:

- **Operational Availability.** The USE produces effective attack submarines (SSNs), ballistic missile submarines (SSBNs), cruise missile submarines (SSGNs), and integrated undersea surveillance systems (IUSS) ready for tasking with improved productivity.
- **CO Decision Making.** The USE produces commanding officers who accurately assess situations, manage risk, and make good decisions.
- **Submarine Expertise.** The USE ensures undersea warfare expertise is available and integrated throughout the joint warfighting, military technology, defense, and government management communities.
- **USE Culture and Standards.** The USE will foster a culture of technical excellence in mariner skills, basic watch standing, assessment, and high standards of conduct.

- **Future Capability.** The USE develops and executes an effective strategy to achieve the future capability identified by fleet, joint force, and combatant commanders at the right time and at the right cost. This strategy encompasses prioritized efforts in four main areas: modernization through programmed initiatives, maintainability and supportability initiatives, managed development of the most promising emerging technology, and *Virginia*-class cost reduction.

As we look forward to the coming year, we need to keep doing what you have done – reliable, proficient accomplishment of our undersea missions. The following are some thoughts as we work into the new year.

- **Primacy of readiness.** Produce ready forces; the right readiness at the right time at the right cost. This includes personnel and family readiness and improving our "culture of fitness."
- **Safety of ship.** Every decision involves the balance of opportunity and risk. Seize opportunity and manage risk to optimize the missions and situations you face.
- **Technical competence of our people.** Well-trained and technically competent personnel are vital to the readiness of the force – strive for the right training, at the right time.
- **Focus on core activity.** Everyone is busy; you must ask continuously: what requires this activity and why? What is its effect? If the activity is not directly linked to our results or objectives, then carefully consider the resources we apply to it.
- **Public trust.** We must never forget that we hold a special trust from our nation – to win in combat and to do the best we can with our assigned resources. This trust requires us to get the most out of every dollar and person we have – to be the best stewards of those resources.

Each of you represents a vital part of a chain of activity that results in unique undersea warfare capability for the nation. Your hard work made 2006 a great year for the force. The dolphins you wear represent not only your professionalism but also that of the entire Submarine Force – past, present and future. Keep up the good work in your respective part of the Enterprise! Smooth sailing, and good hunting.



I am excited to be here in the Nation's capital supporting you, the warriors of the Submarine Force, in the outstanding work you do 24-7-365 for the people of the United States.



RADM Van Mauney, USN, Director, Submarine Warfare

It is great to be back in Washington, D.C., and in particular working among the professionals in the Pentagon. This is my third tour here, and each has been a source of personal and professional satisfaction and a rewarding education in a different element of our Navy. In addition to the great team that RADM Joe Walsh left behind (and resetting the Submarine Warfare Division back to the same number it had when I was last here – N87), the present Navy-wide leadership team here has made it an exciting time to be building our next Navy, and the one after that. I look forward to serving each of you in this worthwhile effort.

Being back in Washington gave me the opportunity to be present when CDRs Brian Howes and Richard Clemmons were awarded the VADM James Bond Stockdale Leadership Award for the outstanding jobs they did commanding USS *La Jolla* (SSN-701) and USS *Roosevelt* (DDG-80) respectively. We are all very proud of these two COs and their crews. I would also like to welcome VADM Jon Greenert to the OPNAV staff. He is serving as N8, Deputy Chief of Naval Operations for Integration of Capabilities and Resources, and joins us from an assignment as Commander, U.S. Seventh Fleet.

Having recently completed a tour in Naples, Italy, I want to take a moment to acknowledge the great work being done every day by our forward deployed submarine groups (7 and 8) and the associated task forces (54, 74, and 69). In the European/Africa area, Submarine Group 8 and Task Force 69 are effectively teamed with the U.S. Naval Forces Europe/Sixth Fleet staff to achieve the effects set forth by the naval component commander for the U.S. European Command. This arrangement, in addition to efficiently directing Submarine Force operations and support across a large theater, is providing our people with a fine opportunity to broaden their skills at the operational fleet level. We have also developed strong linkages between the submarine task forces in Italy and Japan so that information, tactics, techniques and procedures are now common across the globe for our submarines in support of the joint force.

One of my other new hats is chairman of the ASW Cross Functional Board (CFB). The ASW CFB includes surface, aviation, submarine, and fleet leaders in ASW, and will reflect in its activities the high priority that the CNO and the operational commanders have placed on continuing a strong track for Navy ASW capabilities in the future. The team of ASW professionals that supports the CFB (led by OPNAV N874) has completed two CNO Executive Boards that have better defined our ASW challenges, and more closely linked the fleet's ASW Integrated Priority Capability List with the development of future capabilities. More to follow.

It is an exciting time to be in our Navy. The first two ships of the *Virginia*-class (*Virginia* and *Texas*) are both in commission, and we are on track to deliver one ship per year until 2012, when we plan to begin constructing two submarines per year. In September, we were honored to have the first lady, Ms. Laura Bush, help us commission USS *Texas* (SSN-775) in Galveston, Texas. USS *Hawaii* (SSN-776), the third ship of the class, has successfully completed sea trials and was delivered to the Navy ahead of schedule on December 22. Our third SSGN, USS *Michigan* (SSGN-727), successfully completed sea trials in November. We have begun a phased SSGN operational and technical evaluation, and the first SSGN deployment is scheduled in late 2007. Our operational SSNs and SSBNs are doing great work out in the global commons and, with our sailors in Iraq and Afghanistan, are making great contributions to our Nation's security.

I hope you had a great holiday and wish you all the best in 2007. Stop by when you are in the DC area or send us a note; we will welcome and appreciate your advice and ideas.

Vice Adm. Charles L. Munns

Commander, Naval Submarine Forces
Commander, Submarine Force, U.S. Atlantic fleet

Rear Adm. Joe Walsh

Deputy Commander, Naval Submarine Forces
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Charter

UNDERSEA WARFARE is the professional magazine of the undersea warfare community. Its purpose is to educate its readers on undersea warfare missions and programs, with a particular focus on U.S. submarines. This journal will also draw upon the Submarine Force's rich historical legacy to instill a sense of pride and professionalism among community members and to enhance reader awareness of the increasing relevance of undersea warfare for our nation's defense.

The opinions and assertions herein are the personal ones of the authors and do not necessarily reflect the official views of the U.S. Government, the Department of Defense, or the Department of the Navy.

Contributions and Feedback Welcome

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CHINFO Merit Award Winner



Silver Inkwell Award Winner



In keeping with UNDERSEA WARFARE Magazine's charter as the Official Magazine of the U.S. Submarine Force, we welcome letters to the editor, questions relating to articles that have appeared in previous issues, and insights and "lessons learned" from the fleet.

UNDERSEA WARFARE Magazine reserves the right to edit submissions for length, clarity, and accuracy. All submissions become the property of UNDERSEA WARFARE Magazine and may be published in all media. Please include pertinent contact information with submissions.

Send submissions to:

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dearEDITOR,

While reading the Summer 2006 issue of UNDERSEA WARFARE Magazine I noticed that USS *Salt Lake City* (SSN-716) was identified as the first – first flight 688-class submarine to surface through the Arctic Ice. While this is another stunning example of the versatility of our Submarine Force, it is incorrect. The USS *Honolulu* (SSN-718), commanded by Cmdr. Chuck Harris, was the first – first flight 688-class to surface through the Arctic Ice. Your magazine even did a story about the trip ["Heading North" UNDERSEA WARFARE Magazine, Summer 2004].

Respectfully,
Senior Chief Petty Officer (SS) Dan Smith

Senior Chief Smith,

It is true that Honolulu was the first first-flight 688 to surface in the Arctic – however, the ice that she surfaced through is not considered significant. In "Heading North" Cmdr. Chuck Harris, – CO of Honolulu – repeatedly refers to the ice as "polynya" and "slush ice".

According to Jeff Gossett, Technical Director, Arctic Submarine Laboratory, "Honolulu did surface in the Arctic, though not through any significant ice. At most, Honolulu surfaced through slush and ice of only a couple inches thickness. Because

this ice was so insubstantial and posed no risk of damage to the submarine, this is not considered a "through-ice" surfacing.

USS Salt Lake City, on the other hand, surfaced through 1-2 feet of ice. This required extra effort to penetrate, did pose a slight risk of damage to the submarine, and was sufficiently thick for the crew to safely move about on the ice pack. As a result, Salt Lake City's surfacing was considered "through-ice".

dearEDITOR,

Does UNDERSEA WARFARE Magazine have a yearly photo contest?

Sincerely,
Rick Cecchetti, ADS Project Engineer

Mr. Cecchetti,

UNDERSEA WARFARE Magazine does, indeed, host an annual photo contest. The contest – sponsored by the Naval Submarine League – is open to anyone. Photographs may be submitted year-round. However, entries must be received by the second Friday of April to be considered in that year's contest. Entries can be sent to underseawarfare@navy.mil.

sailorsFIRST



Photo by Petty Officer 3rd Class Mark G. Logico

Petty Officers 1st Class Kristina Brockman and Kingsley Van Duzer answer questions about the *Los Angeles*-class submarine USS *Topeka* (SSN-754) from Baker Elementary School students. The school rewarded 25 students with a tour of submarines and facilities at Naval Base Point Loma as part of San Diego Schools' "Catch a Rising Star" program.



First Lady To

First lady Laura Bush ordered the Sailors of USS *Texas* (SSN-775) to bring the U.S. Navy's newest nuclear-powered attack submarine to life in a Sept. 9 commissioning ceremony in Galveston, Texas.

As the crew rushed aboard the submarine before 10,000 spectators at the Port of Galveston, two F/A-18 Hornets roared across the sky, followed by a formation of three World War II-era Navy warplanes.

The first lady, the boat's sponsor and a native Texan, told the crew the country will depend on them to defend democracy and freedom in the era of the Global War on Terror.

"People of a great nation are trusting you to keep them safe," she told the Sailors, adding that the people of a great state are trusting them to carry the state's – and the submarine's – motto to the far corners of the globe: 'Don't Mess With Texas.'

"Every time *Texas* sails, you can be justifiably proud that she carries a piece of each of you with her," said Adm. Michael Mullen, Chief of Naval Operations, noting that the state's fighting tradition has led

Laura Bush Welcomes USS *Texas* the fleet

thousands of Texans to serve in uniform worldwide.

The crew and submarine will build on the legacy of the two battleships and one cruiser that have borne the name *Texas* since the late 19th century, the first lady said. The second *Texas* (BB-35), for example, bombarded Iwo Jima and Okinawa during World War II.

"In the face of tremendous danger, they put aside their fears to take up the cause of freedom," she said.

Texas, she said, embodies the best ideals of its home state: endurance, courage, loyalty, and stealth.

U.S. Sen. Kay Bailey Hutchison (R-Texas), a Galveston native, said her hometown has had strong historical ties to the Navy. The city was the homeport to the *Texas* navy that fought for independence from Mexico, she said, and is home to *Seawolf* (SS-197), a decommissioned World War II-era submarine.

"We are a state that loves our heritage and we have a deep respect for our nation's military," she said.

Petty Officer 3rd Class Benjamin A.

McTee said *Texas* was his top choice of submarines he wanted to serve aboard because he's a native Texan.

The crew, he said, is anxious to set out to sea.

"I'm ready to see it come to life," he said. "It's been a long road and (the Sailors are) ready to get out of the shipyard."

The submarine arrives in the fleet as the second *Virginia*-class vessel, and it will be homeported at Submarine Base New London in Groton, Conn.

U.S. Sen. John Cornyn (R-Texas), the ceremony's principal speaker, said the warship stands as a testament to the nation's unwavering commitment to stand up to extremism in the aftermath of the Sept. 11, 2001 terrorist attacks.

"America has learned the hard way the best guarantor of peace is a strong military," Cornyn said. "Our nation builds weapons of war so we may live in peace."

The high-tech attack boat, with a crew of 134, sails into history as a member of the first post-Cold War class of submarines designed for battlespace dominance against 21st century adversaries lurking in deep



After a "Dolphin pinning" ceremony and reenlistment, first lady of the United States Mrs. Laura Bush and commanding officer of USS *Texas* (SSN-775) Capt. John J. Litherland pause a moment for a photo with the crew. The dolphin ceremony represents attainment of submarine warfare qualifications.

waters,
near shore
environments,
or on land.

The 377-foot-long submarine, with a displacement of more than 7,800 tons submerged, has the capability to travel more than 25 knots and dive below 800 feet. It has the ability to carry torpedoes, mines, and cruise missiles, and transport Naval Special Warfare SEALs (Sea, Air, Land) around the world.

"*Texas* is a very elegant ship, but it is very lethal," said Mike Petters, president of Northrup Grumman Newport News in Newport News, Va., the ship's lead builder in partnership with Groton, Conn.-based General Dynamics Electric Boat.

Virginia-class submarines rank as the first to have an information systems technology division because of the heavy use of computers aboard the vessel. For example, photonics masts that don't penetrate the hull have replaced the traditional periscope, and more than 60 computer and information screens fill the control room. The nuclear-powered submarine's reactor plant will not require refueling during the boat's planned lifespan.

The Navy has a planned class size of 30 vessels. More than 4,000 suppliers in 47 states and the District of Columbia produce millions of parts for the submarines.

Petty Officer 1st Class Barber is assigned to the COMSUBLANT public affairs office in Norfolk, Va.



Photo by Petty Officer 2nd Class Roadell Hickman

(above) During the commissioning of the *Virginia*-class attack submarine USS *Texas* (SSN-775), first lady and boat sponsor Laura Bush gives the command to "man our ship and bring her to life."

(below) *Texas* crewmembers run aboard her, following the command to man the ship given by first lady Laura Bush.



Photo by Petty Officer 2nd Class Roadell Hickman

Managing Your Future:

Changing the Submarine Officer Career Path



In October 2005, the Chief of Naval Operations (CNO), Adm. Mike Mullen, released "Meeting the Challenge of a New Era," his guidance for 2006. The CNO stated that we must continue to develop 21st century leaders through a transformed Manpower, Personnel, Training, and Education (MPT&E) organization that better competes for the talent our country produces and creates the conditions in which the full potential of every man and woman serving our Navy can be achieved.

Both now and in the future, the professional submarine officer must not only be an expert in our submarine core competencies and mission areas, but also be able to effectively lead Navy, fleet, and joint operations. To develop a larger pool of submarine-qualified joint and fleet officers to meet the challenge, several fundamental changes to the submarine career path have been instituted. Among these changes are earlier career gates, tour length adjustments, and joint education goals.

Earlier Career Gates and Adjusted Tour Lengths

To guarantee submarine officers are competitive for "Big Navy" or joint assignments, major command tours should start at 22 years commissioned service (YCS). Based on the old prospective commanding officer (PCO) gate, one would start a commanding officer tour at 17 YCS, and possibly 18 YCS. Following a nominal command tour, the first post commander command (PCC) tour would begin at 21 YCS. Normally two PCC tours are completed before beginning a major command tour. All together, these tours would move the start of a major command tour to 25 YCS based on optimum tour lengths and time for travel between jobs. Beginning major command at 25 YCS is well after the other unrestricted line communities.

Balanced with the need to shift the major command career gate to 22 YCS is the necessity to continue detailing for two assignments following command. Planning for these two assignments provides the Submarine Force the flexibility to send non-joint officers to a joint duty assignment while still maintaining our required operational, warfighting, and waterfront support. Based on these two factors, the commanding officer gate (PCO start date) is being adjusted to 16 YCS to meet the 22 YCS major command tour.

To meet the 16 YCS PCO gate, the prospective executive officer gate will eventually move from July of 13 YCS to April of 12 YCS (for May graduates).

The department head Submarine Officer Advanced Course gate will remain at July of seven YCS. The gate ensures that department heads (DH) receive a competitive department head FITREP prior to the O-4 selection board.

Simply moving career gates to the left will not be enough to maintain the 16 YCS PCO gate. To balance shore assignments required for development of Joint Specialty Officers and core competencies with requisite submarine at-sea experience, the Undersea Enterprise (USE) has directed that JO/DH/XO tour lengths be shortened to 32/32/20 months respectively. This represents approximately a 10 percent reduction in at-sea experience. The key to success while we transition to these new tour lengths is wardroom management. It is imperative that each wardroom work within these boundaries and exploit the shore training infrastructure (VSUB, IDE, Periscope Lab, JO Schools, etc.) to maximize submarine experience prior to officer projected rotation dates (PRD). These tour lengths and earlier career gates slightly modify a known and proven career path while setting up the Submarine Force for success in meeting the military chal-

INTERMEDIATE-LEVEL EDUCATION (O-4)	
Service Intermediate-Level Colleges (ILC)	
- Marine Corps Command and Staff College	JPME Phase I
- Air Command and Staff College	JPME Phase I
- Army Command and General Staff College	JPME Phase I
- College of Naval Command and Staff	JPME Phase I
Non-Resident Education Programs	
- Marine Corps Command & Staff College Distance Education Program	JPME Phase I
- Air Command & Staff College Non-Resident Program	JPME Phase I
- Army Command & General Staff College Non-Resident Program	JPME Phase I
- College of Naval Command and Staff Non-Resident Program	JPME Phase I
Intermediate JPME Courses	
- Joint and Combined Warfighting School-Intermediate (JCWS-I)	JPME Phase II
SENIOR-LEVEL EDUCATION (O-5/O-6)	
Service Senior-Level Colleges (SLC)	
- Marine Corps War College	JPME Phase I (authorized for AY 06, JPME Phase II)
- Air War College	JPME Phase I (authorized for AY 06, JPME Phase II)
- Army War College	JPME Phase I (authorized for AY 06, JPME Phase II)
- College of Naval Warfare	JPME Phase I (authorized for AY 06, JPME Phase II)
Non-Resident Education Programs	
- Army War College Corresponding Studies Program	JPME Phase I
Senior JPME Courses	
- Industrial College of the Armed Forces (ICAF)	Single-Phase JPME Phase (I & II)
- National War College (NWC)	Single-Phase JPME Phase (I & II)
- Joint Advanced Warfighting School (JAWS)	Single-Phase JPME Phase (I & II)
- Joint & Combined Warfighting School-Senior (JCWS-S)	JPME Phase II

lenges of the future.

Joint Professional Military Education

Joint Professional Military Education (JPME) is a collection of joint learning objectives that comprise the educational requirement for an officer to earn a Joint Specialty Officer (JSO) designation. JPME is divided into two phases: JPME Phase I consists of those joint learning objectives identified in the Chairman of the Joint Chiefs of Staff Officer Professional Military Education Policy (OPMEP) that are required to be included in intermediate and senior level service colleges' curriculum. JPME Phase II consists of those joint learning objectives contained in the intermediate and senior level courses offered by the Joint Forces Staff College (JFSC). The final component in becoming a JSO is a 36-month joint tour in an accredited billet (can be reduced to 22 months with a critical occupational specialty waiver submitted by PERS-42). The chart to the left highlights myriad ways to obtain JPME.

JPME Phase I credit is also granted for those who attend the Naval Post-Graduate School in Monterey, Calif., and take the required Phase I courses, which may be in addition to the core curriculum for specific master's programs. PERS-42 will entertain extensions of up to a quarter for officers at NPS to take the additional course load to achieve this important milestone.

JPME Phase II was recently authorized to be granted by the services' war colleges and it is anticipated that all war colleges will be JPME Phase II accredited in the near future. Prior to Congress amending Title 10 with the 2005 National Defense Authorization Act (NDAA), the only JPME II course was National Defense University's (NDU) JFSC 10-week Joint and Combined Warfighting School (JCWS). NDU in-resident courses (National War College and Industrial College of the Armed Forces) have always granted both Phase I and Phase II credit upon graduation. As the Navy adjusts to meet the Chairman, Joint Chiefs of Staff, Joint Officer Development direction, any changes to these goals will be promulgated.

Qualification as a JSO requires full completion of JPME and a qualified joint tour. Nomination is automatic and is based on the completion of the last requirement. Packages to the Joint Staff are submitted twice a year (summer and winter) and



U.S. Navy photo

typically take four to six months to get approved by the Secretary of Defense. Once the list is approved, a naval message will be released with the names of the new JSOs. Throughout this process, there is no paperwork or request necessary.

So why is becoming a JSO so important? Specifically, becoming a JSO meets the CNO's clearly stated goals and commitment to joint military operations and increasing the submarine community's ability to be ready for leadership opportunities in the larger Navy, fleet, and joint arenas. PERS-42 has thoroughly examined the process to ensure that everyone has the opportunity to become a Joint Specialty Officer. In short, the following milestones are goals to meet while on shore tour:

- Post Junior Officer Shore Tour: If at a graduate school, a correspondence course for Phase I should also be completed. If at the Naval Post-Graduate School, JPME Phase I will be included in the curriculum.
- Post Department Head Tour: If not attending a War College, a correspondence course to complete Phase I must

be started. Beginning in FY09 (May 2008 CO/XO Board), Phase I completion will be required prior to screening for commanding officer (CDR command). A deferral will be in place which allows a CO screened individual to complete Phase I prior to relieving as commanding officer (expires FY12). For FY13 CO Selection Boards and beyond, Phase I completion will be required prior to screening for command.

- Post XO Tour: Complete Phase II prior to command.

Wardroom Planning

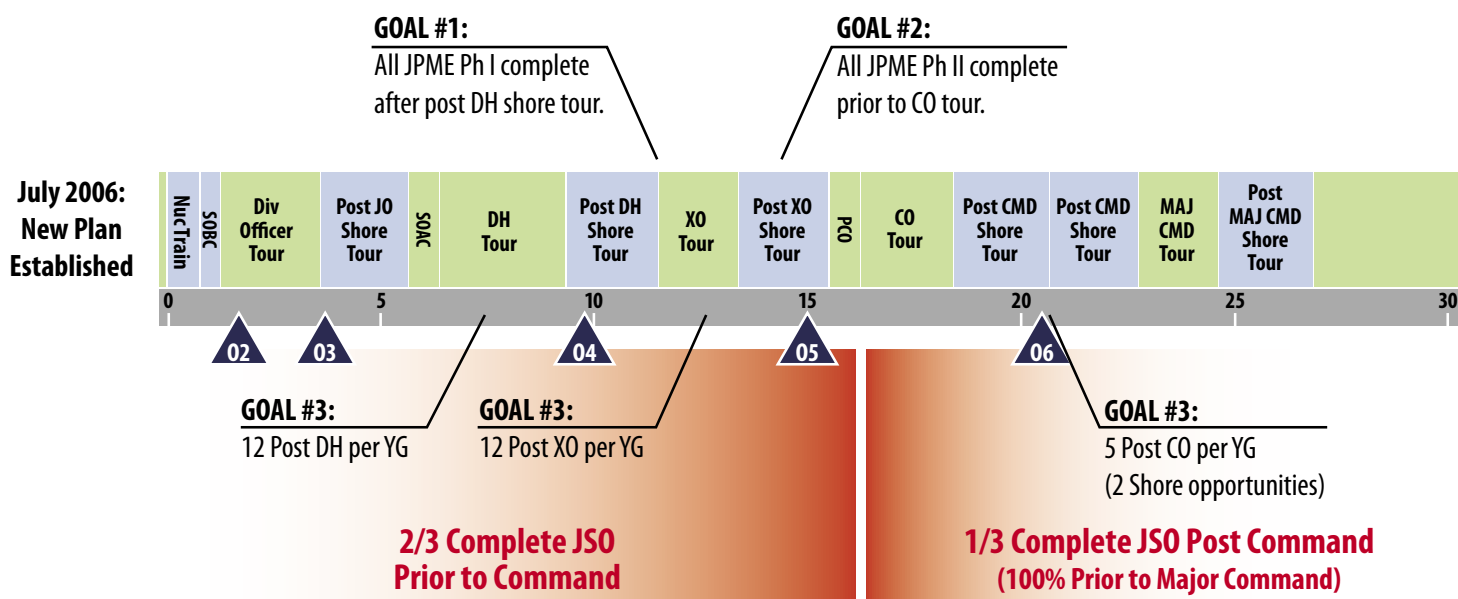
Since July of this year, PERS-42 has begun a new method of conducting wardroom planning. Letters discussing career plans and rotation dates do not need to be submitted to PERS-42. Wardroom planning will now be conducted during detailer trips or conference calls at least once per year. If you have any question as to when the detailers are coming to your area or want to set up a conference call, call PERS-421 at (901) 874-3944. Address any specific issue with the detailers at any time.

Prior to the meeting or conference call, PERS-42 will develop a nominal rotation plan and email you an advance copy. Each meeting/conference call will last approximately 15 minutes and will only cover rotation timelines; detailing issues can be handled with individual detailers. It is important to remember that PERS-42 does not have your operational schedules. One of the main points that you need to bring up is how your future schedule effects wardroom rotation dates.

The world we operate in is changing on a daily basis. As the military transforms to better prepare for the challenges of the future, we must be proactive and manage our people and their careers carefully. Contact your detailer if you have any questions!

Capt. Myers serves as the Director, Submarine/ Nuclear Power Distribution Control and Nuclear Propulsion Program Manager (P-42/N133).


New Submarine Career Path / Joint Qualification Strategy



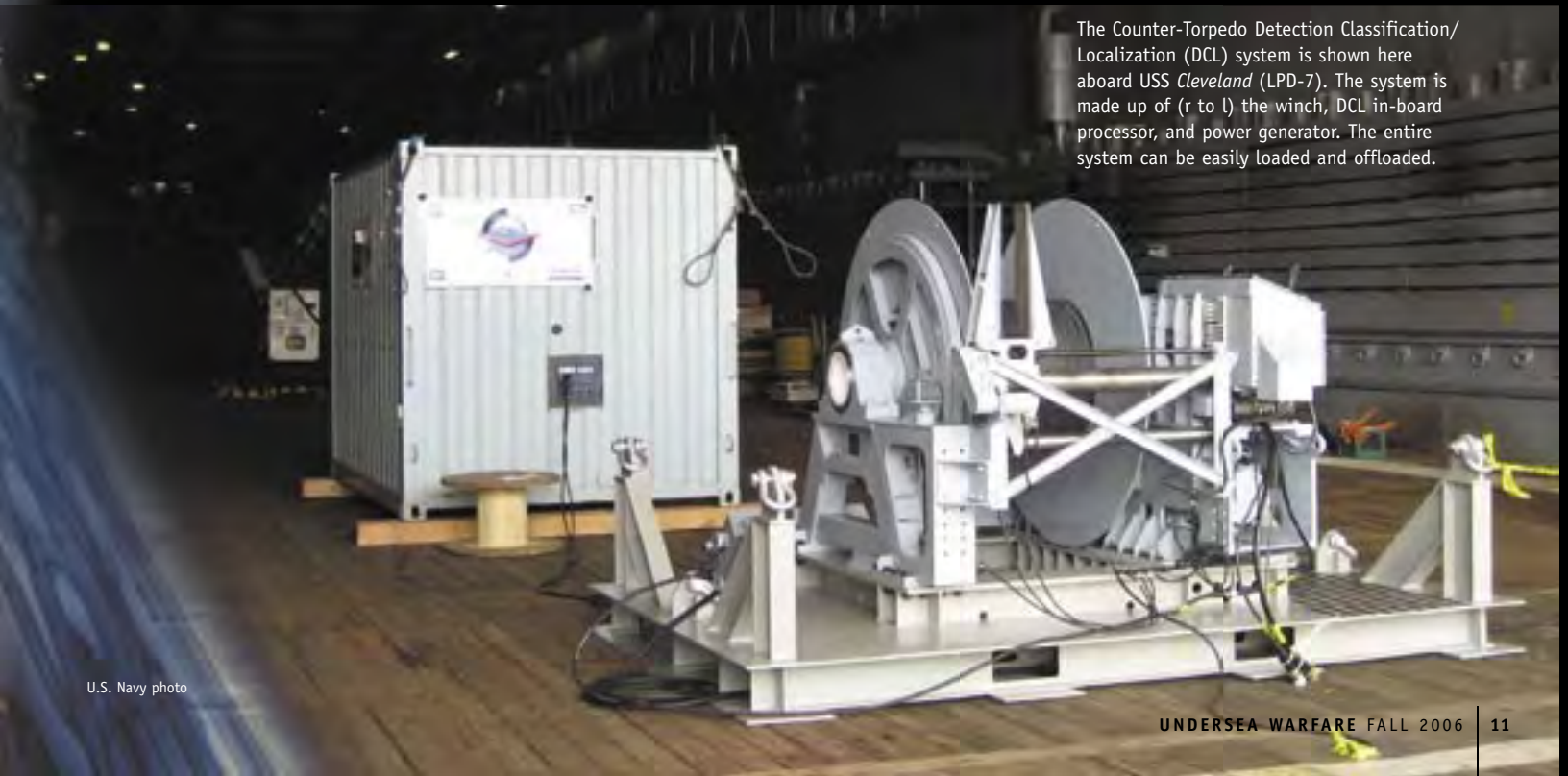
Graphic by Jeff Kendrick

Anti-Torpedo Defense:

**Defeating a Ubiquitous
Threat to Naval Superiority**



At the height of the Cold War in the mid-1980s – as a modern, quieter, and expanded Soviet submarine force seemed ready to challenge the U.S. Navy, anytime, anywhere – concerns spiked when intelligence indicated that the Soviets had developed a new type of long-range torpedo that homed on the wake of surface ships. Existing countermeasures were of no value, and Navy science and technology mavens struggled to find an answer. The “wake-homer” torpedo threat was so severe that then-Deputy Chief of Naval Operations, Surface Warfare (OP-03), Vice Adm. Joseph Metcalf declared the only counter to it was to “...position a frigate astern of every high-value unit.” The response of the frigate community to Metcalf’s “solution” was quick and vocal.



The Counter-Torpedo Detection Classification/Localization (DCL) system is shown here aboard USS *Cleveland* (LPD-7). The system is made up of (r to l) the winch, DCL in-board processor, and power generator. The entire system can be easily loaded and offloaded.



USS *Cleveland* (LPD-7), seen here, was used as a test platform for the counter-torpedo detection/classification/localization operations.

While hyperbole, perhaps, Metcalf's remark underscored the Navy's still-growing concern about the torpedo. For example, information on the 50-knot Soviet Type 65 wake-homing torpedo, what naval strategist Norman Polmar, writing in the December 1989 U.S. Naval Institute *Proceedings*, called the "largest and most lethal non-nuclear torpedo in existence," greatly stimulated research in the United States and other allied navies on ways to defeat these weapons. Later news that the Soviets had developed a rocket-propelled, hyper-velocity (200-knot-plus) *Shkval* torpedo further accelerated the search for effective countermeasures. The danger from even "obsolete" World War II-era torpedoes was dramatically illustrated when the Royal Navy submarine HMS *Conqueror* fired two MK 8 torpedoes, sinking the Argentine cruiser ARA *General Belgrano* during the 1982 Falklands war – the first time torpedoes had been fired in anger against a warship since 1945. (During the Korean War, according to Polmar, air-launched U.S. Navy MK 13 torpedoes were used effectively against a dam in North Korea.)

Although the Soviet Navy imploded following the fall of the Berlin Wall, Russian submarines, sensors, and weapons are commercially available, and they compete for market share with the platforms and anti-ship/submarine torpedo systems of

other countries. Iran, for example, operates three Russian-built Kilo submarines and makes no apologies for attempting to acquire *Shkvals* and advanced wake-homers. "The submarine threat to our strategies and operations is real, and it is growing" the Navy's unclassified ASW publication *Changing the Calculus: Guide to U.S. Navy Anti-Submarine Warfare... Threats, Concepts, and Programs 2005*, concludes. "High speed, wake-homing, and other torpedoes are now available for open purchase," it continues, and "... several navies have taken advantage of the availability of Russian high-performance wake-homing torpedoes that can be fired at long range with a significant probability of kill."

These assessments continue to spur developments on anti-torpedo systems that are just now beginning to bear fruit, and look to provide practical – not hyperbolic – solutions to defending U.S. submarines and surface ships from the nearly ubiquitous threat of torpedo attack.

Past is Prologue

At a classified Undersea Warfare Conference in Washington, mid-August 1948, representatives from the office of the Assistant Chief of Naval Operations (Undersea Warfare) and the National Research Council assessed a burgeoning Soviet submarine force that had begun to incorporate advanced German technologies and systems. The Battle of the Atlantic was still fresh in their minds: "For success we must achieve two things," they concluded, "first we must vitiate the effectiveness of the submarine torpedo, or develop an equally effective counter-weapon."

"Second, we must remove the detection advantage presently enjoyed by the submarine force over the surface ship."

In the following years, several efforts – including "Project GENERAL Type 2-A," a hard-kill anti-torpedo device streamed behind surface ships, which was the focus of the discussions in August 1948 – were undertaken to address the torpedo threat. The U.S. Navy's T-MK 6 Fanfare soft-kill system, which was based on WWII "foxer" devices to defeat German acoustic homing torpedoes, showed some promise, and in 1985 the Navy deployed the AN/SLQ-25 "Nixie" towed decoy. These and other hard- and soft-kill systems – for example, electromagnetically-launched kinetic-kill

projectiles to intercept incoming torpedoes, submarine-generated shock waves to disrupt torpedo guidance systems, and a variety of ship- and submarine-launched expendable acoustic decoys and jammers – provided only limited improvements in countering the more advanced and sophisticated torpedoes coming into Soviet and other navies' inventories.

Two decades later, in mid-2006, the Navy is pursuing several programs intended to "vitalize the effectiveness" of the torpedo, whether launched from a submarine, surface ship, or aircraft, and accomplish the first goal of the 1948 Undersea Warfare Conference, even if the second goal – removing the detection advantage of the submarine over the surface ship – seems as elusive as ever.

Current Efforts

The 2006 edition of the CNO's annual program guide, *Sea Power for a New Era*, outlines key programs intended to enhance U.S. torpedo countermeasures effectiveness. For one, improvements to the AN/SQQ-89A(V)15 USW Combat System on surface warships include a multifunction towed array with acoustic intercept sensor and the Torpedo Recognition and Alertment Functional Segment (TRAFFS) to provide warning that a torpedo is inbound.

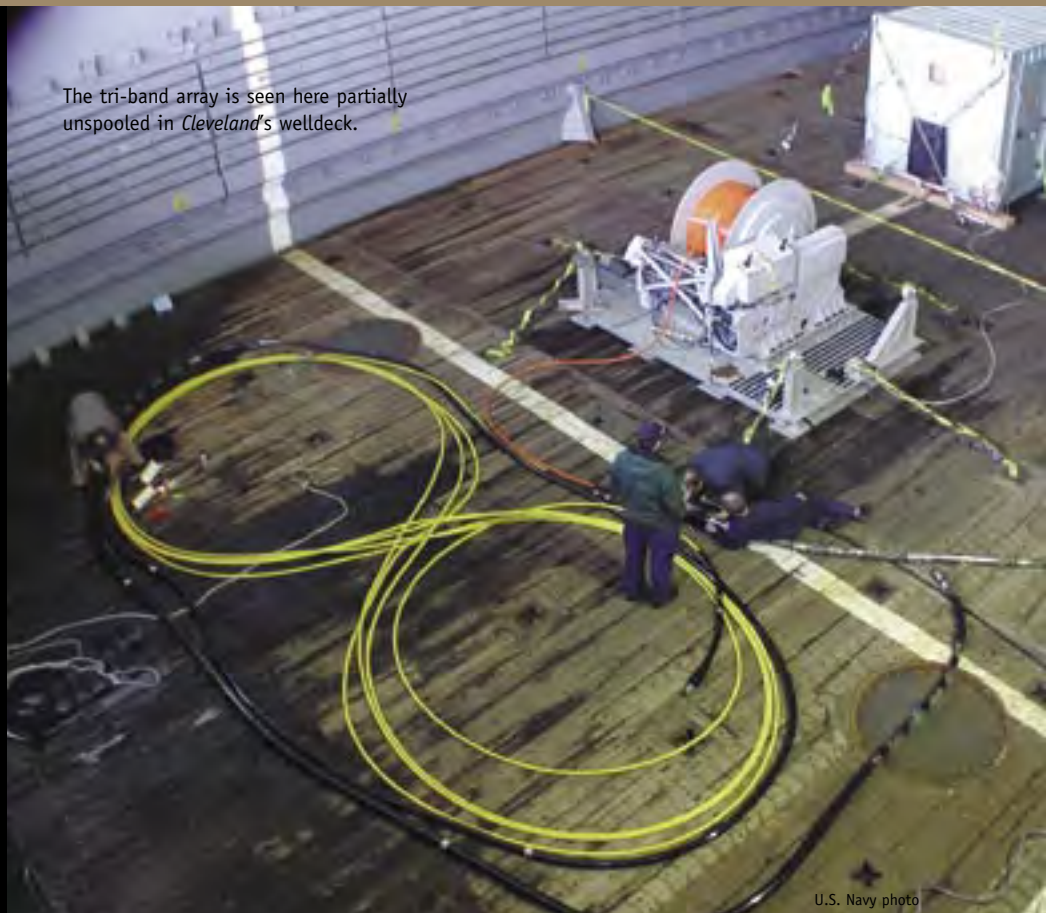
The Navy and Penn State University's Applied Research Laboratory are also developing an Anti-Torpedo Torpedo (ATT) that could be launched from both submarines and surface ships to intercept and destroy inbound threats. (Other key ATT players include the Naval Undersea Warfare Center, Newport, R.I., and the Naval Surface Warfare Centers in Indian Head, Md., and Crane, Ind.) As currently configured, the 200-pound ATT is 6.75 inches in diameter, 105 inches long, and powered by a stored chemical-energy propulsion system similar to the Navy's MK 50 torpedo. Advances in electronics miniaturization, significant increases in microprocessor computation rates, and sophisticated processing algorithms have overcome the shortcomings of the previous ATT program, which was cancelled in 1994. A capability to launch multiple ATTs simultaneously to defeat multiple, salvo-fired torpedoes is a required feature. Tests of the ATT have been planned for late 2006.

Knowledge that a threat is imminent – and a kill mechanism to defeat that threat – are necessary, but clearly are not sufficient to solve the torpedo problem. For this reason, the Naval Sea Systems Command, the Program Executive Office (PEO) for Submarines, and the Office of Naval Research (ONR) have teamed on the AN/WSQ-11 Surface Ship Torpedo Defense System (TDS), which will have some application to submarines as well as to surface platforms. One aspect of ONR's ATT project in the fleet/Force Protection Future Naval Capability program, the WSQ-11 will provide a major upgrade to current TDS capabilities in automated torpedo detection, classification, and localization sub-systems that will deliver enhanced early alertment as well as fire-control quality data for the ATT.

The Counter-Torpedo Detection/Classification/Localization (DCL) system will provide a technical design package and advanced design models for a high-frequency array. It will also provide torpedo detection and tracking algorithms for salvo engagements of up to four threat torpedoes simultaneously. The initial focus is to equip ASW units (e.g., destroyers and cruisers), although future variants could be incorporated into ASW high value unit platforms (aircraft carriers, amphibious assault ships, etc.). The primary elements of the WSQ-11 are:

- > Tripwire DCL, which includes, (1) a Flexible Towed Source (FTS) that retains SLQ-25A Nixie Acoustic Decoy Function for softkill, but adds an active acoustic source for torpedo detection, advanced processing to deal with a quiet threat, and false-alarm reduction enhancements; (2) an Acoustic Intercept Receiver that detects active acoustic signals from threat torpedoes and radiated noise from torpedo propulsion, and a receiver for FTS active returns; and (3) a Command and Control Processor, to conduct active/passive search and provide an automated threat-level response
- > The hard-kill Anti-Torpedo Torpedo for all threats, a self-contained launcher, and a canisterized launch system

continued on page 36



This graphic shows an aircraft carrier towing a tri-band array as well as the type of torpedoes it is designed to detect.

Capt. Kerry Ingalls arrives in Jalalabad, Afghanistan aboard a CH-47 Chinook.



photo courtesy of Capt. Kerry Ingalls

A Submariner Brings His Expertise to Afghanistan

Capt. Kerry Ingalls, commodore of Submarine Squadron 19 in Bangor, Wash., served in Afghanistan from July 2005 to February 2006. While attending the Joint Forces Staff College, he was interviewed by the Commander, Naval Submarine Forces public affairs officer regarding his experience in Afghanistan.

PAO: What was your position in Afghanistan? What were your responsibilities?

Capt. Ingalls: I was in Afghanistan from July 2005 to February 2006. I served as the Director, Political-Military Integration (PMI) on the staff of Commander, Combined Forces Command – Afghanistan (CFC-A), working directly for the Commanding General, Lt. Gen. Karl Eikenberry. This was a great billet, established just before my arrival, that permitted me to partner with virtually every staff officer, coalition officers, officials in the Afghan government (across the spectrum of ministries, not just in the defense area), and of course our country team at the U.S. embassy as well. PMI was one of the primary directors for the staff, and has two subdivisions: Political-Military Affairs and Civil-Military Affairs. Responsibilities under my Pol-Mil Affairs hat included regional engagement with Pakistan (focused on building an enduring military-to-military relationship between Afghanistan and Pakistan), building the Afghan National Security Team and its National Security Policy, and very importantly, aligning



Capt. Kerry Ingalls (right) poses with Col. Jim Yonts (left) and Col. Mike Chesney in Afghanistan on Thanksgiving Day 2005.



photo courtesy of Capt. Kerry Ingalls

Capt. Ingalls and other CFC-A personnel participate in a tribal council meeting.

the work of CFC-A to complement the mission at the US embassy. Under Civil-Military Affairs, I was responsible for Provincial Reconstruction Team (PRT) policy, improving governance and justice systems, and strategic reconstruction to promote economic growth. Of course, I had plenty of help both within the CFC-A headquarters and across the spectrum of U.S. and international partners, including colleagues at the U.S. embassy and at the United Nations Assistance Mission Afghanistan. My staff included Sailors, Marines, Soldiers, and Airmen; Canadians, Brits, Frenchmen, and Romanians.

PAO: How did you come to have this assignment?

Capt. Ingalls: I met Lt. Gen. Eikenberry when we were both assigned to U.S. Pacific Command in Hawaii. Shortly after he was named as the new commander at CFC-A, he extended the generous invitation to join him in Afghanistan. Obviously, this opportunity would not have been realized without the support of submarine force leadership, namely Admirals Munns, Donnelly, and Cassias. I'm very grateful.

PAO: Did you have to travel throughout Afghanistan?

Capt. Ingalls: I spent most of my time in Kabul, but did have the opportunity to travel to several different parts of the country from time-to-time, which came as a welcome break and afforded the opportunity to gain a better perspective on the challenges facing the country. I also traveled to Islamabad, Pakistan on several occasions in execution of my regional engagement responsibilities.

PAO: Were you able to parlay any

of your training/experience in the Submarine Force during your time in Afghanistan?

Capt. Ingalls: I would back that question up a little bit and start by saying that the Navy has been very generous to me in providing a broad and rich career. My graduate degree is in international law and diplomacy, focused on national security, international negotiation and conflict resolution, and Southwest Asia and Islamic civilization. These academic experiences provided a good foundation upon which to build and instilled a good measure of confidence to operate in that ground-centric theater.

That said, I think there are some very good reasons why Sailors in general and submariners in particular are inherently well-equipped to contribute meaningfully in a combined and joint arena.

First, the situation in Afghanistan (and I would imagine in Iraq as well) is constantly changing. There are no manuals defining what needs to be done; innovation is key, and I think naval officers are particularly innovative. We know our doctrine but use it as a stepping off point – we aren't wedded to it at the expense of mission success. Second, the nature of our operations at sea, often conducted independently, requires us to understand commander's intent and then to proceed with confidence, without looking over our shoulders. We don't "call home" asking for guidance unnecessarily. I found this trait to be especially appreciated during my tour in Afghanistan. We're also superior team builders. Sailors train and fight as teams, united across a spectrum of rank and experience. We also practice improvising and fighting hurt. Finally, and this is especially true for submariners, we understand systems and tend to approach problems systematically. This too was use-

ful in Afghanistan. A country is a system of systems – justice affects police efficacy, roads affect both security and commerce, and so on. So while it was clear that some billets on the staff (such as the operations job) needed to be filled by a professional soldier, others like PMI were more flexible, and I think it was a good fit for my skills and personality.

Clearly, we have to man our ships and staffs and our supporting infrastructure. But to the extent that we can do that and also make contributions to these other nationally important missions, the opportunities are rich and worthwhile.

PAO: How do you think this experience will help you in the future?

Capt. Ingalls: First, I truly believe my experiences have made me a better joint officer. Combined with my previous joint experience, I have an even better understanding of combined and joint operations.

My hope is that this experience will benefit not just the joint community or the Navy but especially the Submarine Force in the future. Tactical submarining will always be our bread-and-butter, and the maintenance of those skills – which themselves are evolving as the nature of potential threats evolves – trumps all other pursuits. But I also think that it will benefit our community to have a cadre of officers with a broad spectrum of professional experience and/or qualifications which permits us to make contributions at the joint operational and strategic levels too.

PAO: Did it feel strange to be back when you first returned?

Capt. Ingalls: Professionally, I was struck by how forgotten the Afghan conflict seems. I have met a number of "informed" people who expressed surprise that we still have troops in Afghanistan! I'm also impressed by how little Americans in general seem to know about the campaign, so I feel responsible to share my experiences and the state of the effort with as many people both inside and outside the military as possible.

On a personal level, I had never been away from my family for eight months straight. I never had a bad reunion with my family, and this was no exception! But perhaps even more than any other



photo courtesy of Capt. Kerry Ingalls

deployment, this one was a “whole body” experience. Some parts of Afghanistan lack almost everything we take for granted – safety, health, and prosperity. In that environment, the richness of our lot as Americans really hits home – we are incredibly fortunate people.

PAO: Any comments on the success of U.S. and multi-national efforts in Afghanistan?

Capt. Ingalls: I’m glad you asked about the campaign, not only because of the awareness concerns I mentioned earlier but also because it’s far from over and we’re seeing more and more Navy personnel being called to that theater for service.

The U.S. Ambassador to Afghanistan, Ron Neumann, often says, ‘we’re winning the war but haven’t won it yet’, and that’s exactly what I saw. Consider where we were less than five years ago: The Taliban was in power and sheltering al Qaeda, and the country was in ruins from 25 years of

civil war. President Bush committed our forces to achieve two primary aims: First, to remove al Qaeda and the Taliban regime that harbored them, and second, to establish conditions to prevent Afghanistan from ever again being a haven for terrorists. We have made immense progress toward that first goal in conjunction with our coalition and NATO/International Security Assistance Force (ISAF) partners. And as for the second goal, Afghanistan has a democratically elected president and parliament, a constitution, schools are open, roads, power, water, and communication systems are being built. Just as important, the international community in January recommitted its forces and resources to the reconstruction and stability of the country. If you’re Taliban, things are not looking good.

Against that optimism I would balance some significant concerns for campaign success. First, this is a nascent democracy in a country without strong democratic traditions. The Afghans are working hard,

but it will take time, and they will have to work their way through determining just what an Afghan democracy looks like. Further, with a literacy rate of about 30%, human capital is scarce, and this isn’t something that gets fixed in a handful of years. Drugs are a major concern, not only as a source of corruption and crime but as a potential financial boon to terrorism. The country’s infrastructure still requires immense investment and patience to rebuild. And of course we’re still dealing with al Qaeda and associated movements operating in Afghanistan and in the border region with Pakistan. There’s much work left to do.

So I hope I have left you with a balanced perspective that things are going well but that we can’t take our eye off the ball. Afghanistan represents a generational commitment in order to ensure success, and many of us will have opportunities to contribute.



Art by Nate Ostrow

The Naval Academy's Path to the Submarine Community

When midshipmen at the U.S. Naval Academy enter their preferences for service assignment, it commits them to a career path and a way of life for at least five years after graduation and commissioning. It's crucial for these future officers to have the resources they need to make their decision. The Naval Academy ensures its midshipmen have a wide variety of experiences and exposure to the submarine community, allowing them to make informed and educated decisions.

Most midshipmen choose their service community in November of their senior year. Since 2003, however, the Admiral Frank L. Bowman Scholarship Program allows as many as 20 midshipmen second-class to commit to the nuclear Navy in the spring of their junior year. These potential candidates are interviewed in late March and, if selected, receive their bonuses at that time. Bowman Scholars also participate in a summer internship during their first-class summer, an academic research project during their senior year, and have seats at the Naval Postgraduate School for immediate graduate education programs upon graduation from the Academy.

In 2006, qualified members in the top 500 of their junior class in order of merit

were granted the opportunity to interview early, even if not in the Bowman Scholar program. Fifty-four midshipmen from the Class of 2007, including Bowman Scholars, selected submarines early. The remainder of the submariners from the class of 2007 will be selected in the fall.

Joining the submarine community must be a carefully weighed decision for any future naval officer. To help midshipmen make the right choice, the Naval Academy offers a variety of programs, ranging from academic curriculum to social interaction to fleet-experienced mentors, all designed to expose midshipmen to challenges and opportunities available in the submarine career field.

Much of this exposure comes from the Professional Development Program at the U.S. Naval Academy, which provides midshipmen the perspective they need to make a confident decision through summer training, periodic events on the Yard, the Academy's "Dolphin Club," submarine officers in Bancroft Hall, and instructors in the academic departments. Midshipmen get exposure to the people, places and ships that make up the submarine community. This exposure provides them the familiarity they need to make their decision.

Summer programs open up the fleet to midshipmen and let them see the Submarine Force firsthand. Most midshipmen second-class – college juniors – participate in Professional Training for Midshipmen, or PROTRAMID, a month-long look at various communities in the Navy.

A full week is devoted to submarines during which midshipmen go through simulators, tour facilities, and get underway overnight onboard a submarine. They have the chance to talk to officers and enlisted men about their experiences. PROTRAMID is considered a very valuable experience, and often contributes strongly to midshipmen's decision to "go submarines." Being in Kings Bay, Ga., and getting to see the community firsthand can provide great perspective on the most important personal decision the Navy's future officers make at the Naval Academy.

The Naval Academy also offers its midshipmen two programs that are more submarine specific, SUBTRAMID (Submarine Training for midshipmen) and fleet submarine cruises. SUBTRAMID, a two week program, includes many of the same aspects as PROTRAMID, but for a longer period of time. The midshipmen

embark on deployed submarines for longer cruises and get to see and participate in operations around the world.

Midshipman 2/C Mike Eyler embarked aboard USS *Helena* (SSN-725) for two weeks for SUBTRAMID during the summer of 2005. "I liked the exercises we did. I thought it was neat that we could be so successful in these exercises," Eyler said. "A lot of the time it seemed like we won 'the game'. That was pretty sweet."

During the academic year there are officers assigned and programs available on the Yard to enhance midshipmen's knowledge about the Submarine Force. The "Dolphin Club," for example, hosts events for midshipmen interested in the submarine community. Lt. Derek Dryden, one of the Brigade of Midshipmen's company officers, is the officer representative for the "Dolphin Club." Dryden and Midshipman 1/C Scott Becknell, "Dolphin Club" president, are in charge of putting on events that will introduce interested midshipmen to submarine officers in the area.

Among the biggest of these events is the annual Submarine Birthday Ball, attended by midshipmen, Academy officers, retired submariners, and their guests. The birthday ball is a rare opportunity for these prospective submariners to talk to men who served in the Submarine Force during World War II, the Korean War, and the Cold War. Guests don their dinner dress blues and enjoy a dinner in Smoke Hall. The "Dolphin Club" also hosts tailgaters at home football games and organizes picnics, usually hosted by one of the officers living on the Yard.

Midshipman 1/C Nick Marston cites the generosity of the officers on the Yard as a great characteristic of the "Dolphin Club." He said their welcoming attitude encourages midshipmen to get involved and to learn about the community, and that they are open about their experiences in the submarine community, giving midshipmen a realistic look at what they can expect if they go sub.

The Academy also hosts periodic Career Information Program briefs for midshipmen, giving them information about current submarine operations and introducing them to submarine officers from submarine bases around the country. These briefs show midshipmen the Navy's current Submarine Force, its leaders, and missions. These programs allow midshipmen

to hear how the submarine community is contributing to the War on Terror directly from experienced warfighters. They get fleet perspective on the relevance of the Submarine Force, modern requirements of the U.S. Navy, and how active submarines have been fulfilling those requirements.

The Academy has a network of officers throughout the Yard to help answer questions and prepare midshipmen for interviews at Naval Reactors. Each company has a submarine representative available to help. In prepping a prospective submarine candidate, the officers will help midshipmen with interview questions and interview "dos and don'ts." In addition to preparing midshipmen for interviews, some company officers will also accompany their midshipmen to the interview itself.

Every midshipman considering submarines has the chance to benefit from this kind of preparation. The officers who facilitate this process often provide insight from their own interview experience, and for some, insight they've gained from serving as interviewers as well.

There are also many submarine officers who serve as academic instructors on the Yard. They act as ambassadors for the submarine community every day in class, and make up a large part of midshipmen's attitudes towards the community. These instructors give midshipmen a more personal look at the community and someone they can interact with on a daily basis to learn about submarines.

"The officer who impressed me the most was my Boats instructor," said Eyler. "He

was a great instructor who conveyed the importance of technical competence in the Submarine Force," he said.

The Naval Academy offers a specific curriculum that has direct application to the nuclear Navy, and specifically, submarines. All midshipmen first-class – or seniors – selecting submarines take the Junior Officer practicum in the Spring. The midshipmen also have the option of taking an alternate Steam course, which includes a look at naval nuclear reactors. For a more in-depth study of nuclear power, the Mechanical Engineering department offers a Reactor Physics course, and the Physics department offers a course titled Underwater Acoustics and Sonar. The professional courses all midshipmen take include portions on the submarine community.

Whether it's behind the desk, behind the lectern, or behind the periscope, the Naval Academy has a diverse and real-world program in place to introduce its future officers to the Navy's submarine community. This program is designed to ensure that experienced fleet-warriors have a direct impact on the up-and-coming submariners that will lead the community forward to meet the challenges ahead.

Midn. 1st Class Alexander Ludington is a U.S. Naval Academy senior majoring in Physics. Upon graduation, Midn. Ludington will enter the submarine community. He conducted his PROTRAMID aboard USS *Albany* (SSN-753).

photo courtesy of USNA Photo Lab





Q&A

The U.S. Submarine Force

From the Perspective of Midshipmen

Photos by Gin Kai, USNA



(Counterclockwise from upper left): Midns. 1st Class John Applebaum, James Osyf, Paul Evans, Andrew Townsend, and Daniel Huynh.

UNDERSEA WARFARE Magazine had an opportunity to talk to several 1st Class midshipmen at the U.S. Naval Academy shortly before their graduation and commissioning. These midshipmen had made the decision to “go subs” and join the Submarine Force. What follows is a candid discussion of their thoughts, opinions, and expectations as they become officers in the U.S. Submarine Force.

Q: What made you decide to choose the submarine community?

Midn. 1st Class Andrew Townsend: This past summer I had the opportunity to go on a submarine cruise, and I discovered that I liked the submarine community and the Sailors. I think opportunities like the summer cruise provide you with tremendous amounts of information so you can weigh your career options.

Midn. 1st Class Daniel Huynh: I had heard a lot about the Submarine Force during my plebe year and because of all this positive – first hand – information I was hearing, I decided I needed to find out for myself about the submarine community. I had the opportunity to go on a summer cruise as well, and when I was onboard I discovered a great working environment. There also seemed to be a lot of camaraderie amongst – not only the officers – but the entire crew as well. On top of all this, the missions that submarines conduct seem both interesting and vital to our national security.

Midn. 1st Class Paul Evans: I was really impressed with the Sailors of the Submarine Force. My cruise was humbling because everyone onboard was extremely intelligent; there is a lot of potential for the crew to come together and perform to very high standards. I think the boats themselves are phenomenal as well. Both the current and future capabilities of the boats are very exciting to me because of the array of missions they are able to expertly carry out.

Midn. 1st Class John Applebaum: I’ve always thought that the Submarine Force conducted very exciting missions – some of the most exciting in the Navy.

Midn. 1st Class James Osyf: Submarines carry out such diverse and interesting missions – that is what initially intrigued me. The roles and missions of the submarine are evolving which also attracted me to the submarine service.

Q: Describe your thought process as you made your decision to “go subs.”

Midn. 1st Class Townsend: Talking to different submarine officers on ‘The Yard’ gave me a great sense of both the community I’d be working in and the quality of the Sailors I’d be working with. The summer cruise also helped as well. You don’t really know how you are going to feel being submerged in this unusual environment until you are actually out there.

Midn. 1st Class Evans: I agree that the cruise is a big part of the decision making process. Learning about submarines in class is one thing, but getting out there and seeing – first hand – how the submarine operates and learning about the systems really influenced my decision.

Midn. 1st Class Osyf: For me, talking to the JOs [junior officers] was the biggest factor influencing my decision. On ‘The Yard’ you get a “top down” perspective of the Submarine Force from O-5s and O-6s, but when you are able to get first-hand feedback from an O-2 out in the fleet you get a very candid and honest look at the

Submarine Force. I appreciated that candor and it greatly influenced my choice.

Q: Did you come into the Academy knowing you wanted to “go subs” or was it a gradual progression towards submarines?

Midn. 1st Class Applebaum: I had no idea – when I arrived here as a plebe – where I wanted to end up, I was maybe leaning a bit towards becoming a SWO (Surface Warfare Officer). But then at the beginning of my 2nd Class year I started to give submarines a hard look. This was right around the time I went on my first cruise aboard a submarine.

Midn. 1st Class Townsend: Early in my time at the Academy I hadn’t really firmed up where I wanted to go. I was kind of all over the place. But at the end of my 2nd Class year I thought submarines might be the way I wanted to go. I hadn’t been on a submarine yet, so I signed up for my first cruise and made up my mind then.

Midn. 1st Class Osyf: I kind of went through a progression. I came in thinking I wanted to go subs, but halfway through I got caught up in the Marine Corps option. And then halfway through my 2nd Class year I came back to the idea of going submarines because it provided such a unique and interesting option for me.

Q: What goals do you have for yourself as a submarine officer?

Midn. 1st Class Townsend: I, personally, would like to be close with my Sailors. Get to know them so I can learn their strengths so we can have a department that works well together. I think knowing everyone a little better helps the department to get along and inevitably be more productive.

Midn. 1st Class Osyf: *Especially* in a closed environment.

Midn. 1st Class Evans: I think one of the big things a JO can do is to create opportunities for your enlisted Sailors to excel. All of your enlisted guys are really intelligent, some of the brightest in the Navy, and the only difference between them and me is that I had the opportunity to go to college. I really think one of the best things a JO can do is to encourage

enlisted Sailors to pursue their education, be it going for a bachelor’s or a master’s degree.

Q: What was the most surprising aspect of your cruise or something you did not already know about the Submarine Force that you picked up during that first cruise?

Midn. 1st Class Osyf: The interaction between the enlisted Sailors and the officers was interesting to me. You always hear about the closeness of the crews, but the interaction and respect shown between them was a valuable lesson. The summer before my submarine cruise, I did a surface cruise and the way an O-1 might treat a chief petty officer versus the level of respect given aboard the submarine is pretty different. It was very interesting because on submarines, the officers are more of the managers and the enlisted guys are the experts in their fields so it isn’t out of place for an enlisted Sailor to say, “Are you sure you want to do that?” That whole dynamic was very interesting to see firsthand.

Midn. 1st Class Huynh: The interaction between the officers and the crew was impressive. Here on ‘The Yard’, the company officers and the other JOs can’t really have that kind of relationship here because this is more of a training environment. But when I reported to my boat and saw how at ease everyone was with each other, it proved to be an effective way to operate.

Midn. 1st Class Osyf: It’s amazing how tight the whole community is, not just the guys on the boat but submariners themselves. It seems like everyone knows everyone in the Submarine Force.

Q: What do you anticipate being the biggest challenge you’ll face as a submarine officer?

Midn. 1st Class Applebaum: I think the biggest challenge will be getting my division in order. When you are on shore, it is pretty easy to get everyone to work together. When you are spending months at sea in some difficult conditions and situations, it is hard to achieve that same level of teamwork.

Midn. 1st Class Osyf: Living up to expectations during that first tour will be a



From l to r: Midns. 1st Class Townsend, Evans, Osyf, Applebaum, and Huynh.

challenge. There is a pretty big experience gap we’ll have to overcome. Walking in and working with a chief who has been in the Navy 20 years can be a bit intimidating and a humbling experience.

Midn. 1st Class Evans: I think, initially, balancing your work load will be tough. Working on your qualifications coupled with your administrative work all the while standing watch will pose a bit of a challenge at first. It will just take some time to get into that groove and work within the process to get accustomed to the volume of work and responsibilities.

Midn. 1st Class Osyf: Of course getting on the new sleep schedule is going to be tough too.

Midn. 1st Class Huynh: Being away from family and friends while on a long deployment will be a challenge – especially for me – because I’ll be getting married shortly after graduation.

Q: How has the Academy prepared you to work aboard a submarine?

Midn. 1st Class Townsend: The workload and the leadership positions that a lot of midshipmen going subs take on have been a pretty good preparation tool. They’ll help you to balance your workload and responsibilities on the boat better.

Midn. 1st Class Osyf: Probably company life has been the most important preparation tool for me. In the company, the company commander can be your best friend. But you have to work out that chain-of-command so that you both know

continued on page 35



From the fleet to “The Yard”

Prior Enlisted Sailors Bring Fleet Experience to the Naval Academy

Each June, approximately 1,200 young men and women report to the U.S. Naval Academy in Annapolis, Md., hoping to succeed in one of the country's most challenging academic environments. This year, over 90 of those incoming midshipmen already have an idea what they're getting into, because they come from the fleet as prior enlisted Sailors and Marines.

The Academy produces between 900 and 1,000 ensigns and second lieutenants every year. Making it to that top tier is a long and challenging road, specifically designed to weed out those who aren't truly dedicated and committed.

The United States Naval Academy's selection process is very stringent. More than 11,000 prospective midshipmen apply each year. Of that number, only about 4,000 receive official nominations. For enlisted applicants, an official nomination can come from the Secretary of the Navy. A sample request form can be found in OPNAV Instruction 1420.1.

Of those initial 4,000 nominations, approximately 1,800 applicants are deemed to be scholastically, medically, and physically qualified candidates. Approximately

1,500 are given offers of admission, with roughly 1,200 accepting an appointment to the U.S. Naval Academy.

Senior Chief Petty Officer (SW) Ephriam Maxwell is assigned to the admissions department at the Naval Academy. He serves as the designated point of contact for enlisted Sailors navigating the application process.

“The main things we look at are your transcripts, military service, and your commanding officer's recommendation,” Maxwell explained. “We want the top performers, people who have been recognized for something like Sailor or Junior Sailor of the Quarter. People in leadership positions, especially in combat, have an edge.”

The average midshipman tends to be from the top 20 percent of his or her high school graduating class. Standardized Academic Test (SAT) scores must be above 500 in critical reading and 550 in math with a combined score of at least 1050. Candidates who took the Academic Comprehension Test (ACT) must yield a composite score of 22 in English and 24 in mathematics. The results for either the SAT or ACT must not be more than two years old, or a retest will be required.

However, if an applicant decides to retake either test to improve his or her score, the higher of the two scores will be counted.

A curriculum featuring mathematics, English, chemistry, physics, history, and foreign language is strongly recommended. This background helps prepare candidates for the Academy's heavy concentration in math and science.

If an otherwise promising candidate falls a bit short of the academic requirements, they may be offered a seat at the Naval Academy Preparatory School (NAPS). NAPS is a year-long academic program that helps candidates strengthen their skills in the core curriculum areas of chemistry, physics, English, and calculus.

The admissions board also looks at demonstrated leadership at present and past commands; top 20 percent performers in their respective “A” schools or “C” schools are encouraged to apply.

“Say you have a 90 percent or above in your respective ‘A’ school, especially in the top ten ranked graduates of Nuclear Power School – that makes you really competitive as a candidate,” said Maxwell. “The most common misconception among prior service applicants is that you have to have

been in the fleet to apply. This isn't true."

Applicants must be under the age of 23 as of July 1st of the year of admission to the Academy. The applicant must have the recommendation of his or her commanding officer, be able to exceed Physical Readiness Test standards, cannot be married, and cannot have legal dependents. Moral character is a must, including no disciplinary actions under the Uniform Code of Military Justice (UCMJ) article 15 and no convictions by civilian courts during the three years prior to application.

The Academy's physical fitness requirements are more rigorous than the fleet standards. Whereas the "60-60-12" rule (60 push-ups, 60 sit-ups, 12 minute 1.5 mile) will guarantee a pass in the fleet, the Academy's Candidate Fitness Assessment (CFA) imposes higher standards on the midshipmen.

The CFA consists of a basketball throw, shuttle run, modified sit-ups, push-ups, and a one-mile run. The performances in each event are recorded and then rated on a scale. The scale contains three levels: competitive, slightly competitive, and not competitive. The midshipmen's Physical Readiness Test standards are slightly higher as well. The minimum requirement for the biannual PRT for a 19-year-old male is 70 sit-ups, 65 pushups, and a 10:30 mile and a half.

After earning a commission as an ensign or Marine Corps second lieutenant, Naval Academy graduates have a minimum five year service requirement, which may be longer for certain fields of specialty. For prior enlisted Sailors, any time they have left on their current enlistment is absorbed into that minimum service requirement.

The United States Naval Academy's mission is to develop midshipmen morally, mentally, and physically to prepare them to be the next generation of leaders in the fleet. A Sailor with high hopes might wonder how they could get their shot at a commission through the Academy. It starts with dedication, hard work, and perseverance.

Marine Corps 2nd Lt. Timothy Schmitz graduated in the Class of 2006. Schmitz serves as an example for all enlisted personnel with the desire to push themselves forward.

Schmitz dropped out of high school as a junior. He enlisted in the Marine Corps at 17. He was a corporal, the equivalent of a third class petty officer, by the time he was 18, taking computer courses at a

local community college in his spare time. When he initially applied to the Naval Academy, he was denied because he didn't have a diploma, but when a space became available at NAPS, Schmitz was given the opportunity on the condition that he earn his GED.

Once at the Academy, Schmitz flourished. When he graduated four years later, he was second in his class with a double major in economics and political science. He learned to speak Japanese, and was one of only 32 college students nationwide selected for the prestigious Rhodes Scholar program at the University of Oxford in England.

Midshipman 2nd Class Andy West, a junior at the Academy, was a petty officer third class at the Naval Nuclear Propulsion Training Unit in Ballston Spa, N.Y. "I wanted to come to the Naval Academy to be an officer. I wanted to further advance myself in my career and have the opportunity to lead," West said.

West credits his status as a student of the Navy's Nuclear Power School for helping him meet the Academy's high admission requirements. "Success in nuke school definitely helps when you're trying to get in," said West.

West is now an oceanography major and intends to serve the fleet as a Surface Warfare Officer. However, he recently got the opportunity to put his enlisted experience to use. West spent a few weeks aboard USS *Alexandria* (SSN-757) for his summer cruise, a period of time when midshipmen are attached to various commands throughout the fleet to get a taste of what that community has to offer.

"It was a great experience. I really loved it," said West. "I got to apply a lot of the skills I acquired in engineering school."

When asked about his experience at the U.S. Naval Academy, West said, "It's been a challenge. I've definitely learned a lot more about leadership here than I could've ever learned anywhere else."

According to West, there are many things Sailors in the fleet can do to improve their chances of being selected. "The main thing that's going to help someone applying from the fleet is showing initiative. The initiative to learn and initiative to lead are imperative," West said.

West believes that initiative must start from the day a junior Sailor reports to his or her command, even if that Sailor starts as an E-1. "Stay at the top of your division.

Volunteer. Take classes and training every chance you get. You come to the Academy to become a leader. The more you show how much you want to do just that, the better your chances of getting in."

Midshipman 3rd Class Kara Kamuda was previously a petty officer third class stationed in Bethesda, Md. In her three years of service she went through the hospital's intensive care unit, cross-trained to cardiac intensive care, and ultimately wound up on President George W. Bush's Medical Evaluation Treatment Unit (METU).

"I had always wanted to become an officer," said Kamuda. "I saw midshipmen pass through the hospital on a regular basis. It's when I began to wonder who these people in the strange uniforms were that it began. I realized I wanted to do more in the Navy."

For Kamuda, the application process took longer, so perseverance and dedication are essential. "I think the time between when I submitted my application and the time it all actually got processed was around a year and a half."

Kamuda says it was worth the wait, and is now an English major at the Academy. She is looking at going back to her medical roots once commissioned. To those considering applying to the Academy, she offers her advice.

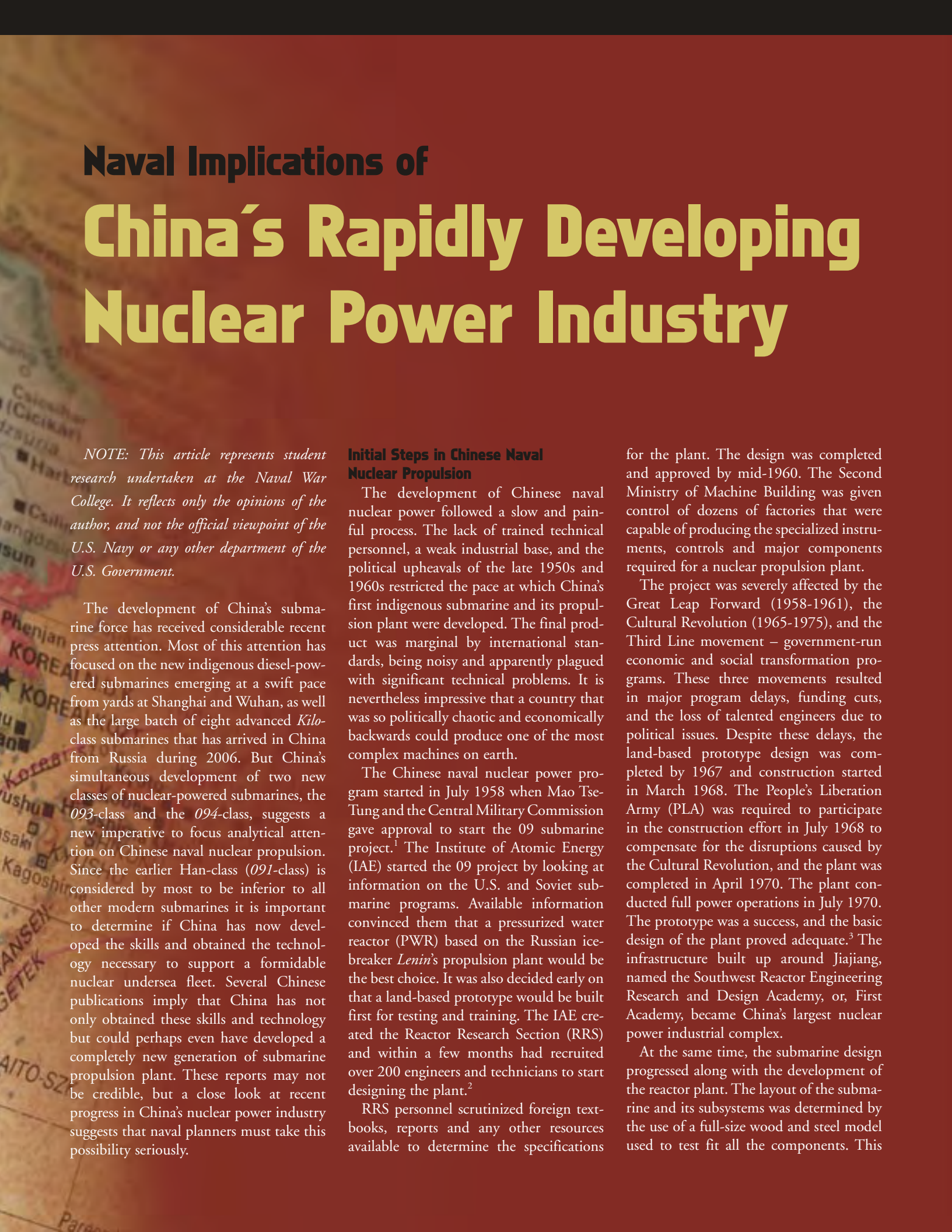
"Know what you are coming into," Kamuda said. "The Academy produces officers, and subsequently leaders. Be sure that you want to be an officer. It takes dedication, and being humble. You'll be answering to people who are sort of new to the leadership position as well. In a sense, you're taking a step backward, but when it's all said and done you'll be making up for it with a giant leap forward."

For questions regarding applications, the Academy, and how to get started on your track to becoming a midshipman, write to:

**U.S. Naval Academy
Candidate Guidance Office
117 Decatur Road
Annapolis, MD 21402-5018
Or e-mail Senior Chief Maxwell
at Emaxwell@usna.edu**

Seaman Recruit Matthew Ebarb is assigned to the public affairs staff at the U.S. Naval Academy, where he serves as a journalist and photographer for the Naval Academy newspaper *The Trident*.



A background map of East Asia, showing parts of China, Korea, and Japan. The map is partially obscured by the title text. The title is in a large, bold, yellow font. The subtitle is in a smaller, white font.

Naval Implications of China's Rapidly Developing Nuclear Power Industry

NOTE: This article represents student research undertaken at the Naval War College. It reflects only the opinions of the author, and not the official viewpoint of the U.S. Navy or any other department of the U.S. Government.

The development of China's submarine force has received considerable recent press attention. Most of this attention has focused on the new indigenous diesel-powered submarines emerging at a swift pace from yards at Shanghai and Wuhan, as well as the large batch of eight advanced *Kilo*-class submarines that has arrived in China from Russia during 2006. But China's simultaneous development of two new classes of nuclear-powered submarines, the 093-class and the 094-class, suggests a new imperative to focus analytical attention on Chinese naval nuclear propulsion. Since the earlier Han-class (091-class) is considered by most to be inferior to all other modern submarines it is important to determine if China has now developed the skills and obtained the technology necessary to support a formidable nuclear undersea fleet. Several Chinese publications imply that China has not only obtained these skills and technology but could perhaps even have developed a completely new generation of submarine propulsion plant. These reports may not be credible, but a close look at recent progress in China's nuclear power industry suggests that naval planners must take this possibility seriously.

Initial Steps in Chinese Naval Nuclear Propulsion

The development of Chinese naval nuclear power followed a slow and painful process. The lack of trained technical personnel, a weak industrial base, and the political upheavals of the late 1950s and 1960s restricted the pace at which China's first indigenous submarine and its propulsion plant were developed. The final product was marginal by international standards, being noisy and apparently plagued with significant technical problems. It is nevertheless impressive that a country that was so politically chaotic and economically backwards could produce one of the most complex machines on earth.

The Chinese naval nuclear power program started in July 1958 when Mao Tse-Tung and the Central Military Commission gave approval to start the 09 submarine project.¹ The Institute of Atomic Energy (IAE) started the 09 project by looking at information on the U.S. and Soviet submarine programs. Available information convinced them that a pressurized water reactor (PWR) based on the Russian icebreaker *Lenin's* propulsion plant would be the best choice. It was also decided early on that a land-based prototype would be built first for testing and training. The IAE created the Reactor Research Section (RRS) and within a few months had recruited over 200 engineers and technicians to start designing the plant.²

RRS personnel scrutinized foreign textbooks, reports and any other resources available to determine the specifications

for the plant. The design was completed and approved by mid-1960. The Second Ministry of Machine Building was given control of dozens of factories that were capable of producing the specialized instruments, controls and major components required for a nuclear propulsion plant.

The project was severely affected by the Great Leap Forward (1958-1961), the Cultural Revolution (1965-1975), and the Third Line movement – government-run economic and social transformation programs. These three movements resulted in major program delays, funding cuts, and the loss of talented engineers due to political issues. Despite these delays, the land-based prototype design was completed by 1967 and construction started in March 1968. The People's Liberation Army (PLA) was required to participate in the construction effort in July 1968 to compensate for the disruptions caused by the Cultural Revolution, and the plant was completed in April 1970. The plant conducted full power operations in July 1970. The prototype was a success, and the basic design of the plant proved adequate.³ The infrastructure built up around Jiajiang, named the Southwest Reactor Engineering Research and Design Academy, or, First Academy, became China's largest nuclear power industrial complex.

At the same time, the submarine design progressed along with the development of the reactor plant. The layout of the submarine and its subsystems was determined by the use of a full-size wood and steel model used to test fit all the components. This

slowed construction but avoided costly rework to the actual hull, and the reactor was in place by early 1971. The submarine was able to get underway for the first time on August 23, 1971. Not surprisingly, many technical abnormalities occurred during sea trials, and it was not until 1974 that the submarine was deemed ready to join the fleet.

Overall, the story behind the building of the Chinese nuclear submarine is also the story of building the Chinese nuclear industry, and in some ways was the basis for building the entire Chinese industrial system. The technology that was developed by Chinese scientists and engineers on the 09 submarine project and other strategic weapons systems helped to build the confidence of a nation that had never had a significant industrial base. Overcoming a vast number of technical challenges amidst the political chaos of the 1960s showed the extraordinary determination of the Chinese to complete the submarine project, and the potential they had to accomplish other high technology projects.

The Organization of China's Nuclear Industry

The Chinese nuclear industry traces its roots back to January 15, 1955, when Chairman Mao and the Central Secretariat decided to develop atomic weapons. This decision made it imperative to develop the technical and scientific knowledge required

to build bombs, which also developed the technology base for building nuclear-powered submarines and eventually a robust civilian nuclear power industry.⁴

The Second Ministry of Machine Building was formed in 1958. It was tasked with the development of nuclear weapons, a nuclear submarine propulsion plant and all associated industries. The Second Ministry controlled every aspect of the nuclear industry, from prospecting, mining and processing uranium, processing fuel, constructing nuclear facilities, to developing and producing all instruments and control (I&C) equipment.⁵ In 1982 its name was changed to the Ministry of Nuclear Industry (MNI) and in 1988 it was reorganized into the China National Nuclear Corporation (CNNC). CNNC consists of over 100 subsidiary companies and institutions and controls the vast majority of the civilian and military nuclear programs.⁶

The China Institute of Atomic Energy (CIAE) is the main research and development organization of CNNC. It was created in the early 1950s and directly supervised the development of the first submarine nuclear power plant as part of the 09 submarine project. The CIAE created the Reactor Engineering Research Section in 1958⁷ and this became the Reactor Engineering Institute in 1964.⁸ The Reactor Engineering Institute (Code 194) did the initial design studies for the 09 submarine project⁹ and today is still

the primary design institute for submarine propulsion plants.¹⁰

Recent Developments

The Chinese have built eleven civilian power plants over the last two decades and have plans for at least four more in the very near future. This is more than have been built by any other country recently. These plants have been built with a combination of Chinese and foreign designs and components that have each added to China's engineering and design prowess. China's strong economic growth during this time has allowed it to purchase the most advanced nuclear technology available. The sources of this technology are coming from every country that has a nuclear power industry, including the U.S.-based Westinghouse Nuclear, AREVA (majority owner of Framatome ANP) of France, Atomic Energy of Canada Limited (AECL), Siemens of Germany and several Russian companies and institutes. These companies are looking for new markets since their home countries have ceased to build new plants or have significantly cut back on the numbers planned. This makes China the most active market in the world for the sale of nuclear power plants and their supporting technology. It is estimated that China has spent over \$100 billion dollars on its nuclear power industry in the last decade and plans to spend another \$20 billion per year for at least the next decade.

The contracts between China and foreign companies have also required extensive training of Chinese engineers and technicians by foreign companies. This has included Chinese engineers having full access to both Westinghouse Nuclear and Framatome's latest civilian nuclear power plant designs. AECL and Framatome have also provided advanced Computer Aided Drafting and Design (CADD) software and training to allow the Chinese to use this software to design complex systems.

The extent of foreign involvement in China's nuclear power industry cannot be fully explored here, but it starts with the production of fuel for the nuclear power plants, includes the design, construction, and operation of nuclear power plants, and continues through to the disposal of nuclear waste and other nuclear services. Much of this advanced technology and expertise could also be used to develop advanced submarine power plants.

Photos courtesy of www.sinodefence.com



(Top row) China built five 091-class nuclear-powered attack submarines between 1967 and 1990.

(Bottom row) The 092-class, China's first nuclear powered ballistic missile submarine, was based on the design of the 091-class.

“...the use of the technology gained by the civilian nuclear industry has the potential to greatly improve submarines designed and built in China.”

Naval Implications

The above discussion demonstrates the extent of foreign nuclear technology transfer to China. The technology sold to Chinese companies is in fact being sold to CNNC, a state-owned enterprise. It is therefore reasonable to assume that any technology transferred to CNNC will be made available to the military.

The basis for any country's naval nuclear power industry is a strong civilian program that allows for technology to be developed and the costs shared between the two programs. This is certainly the case for the United States and France. Westinghouse Nuclear was one of the original designers of the U.S. Navy's submarine and aircraft carrier nuclear power plants, and also built many of the civilian nuclear power plants in the United States. AVERA Group owns Framatome (builder of civilian nuclear power plants) and Technicatome which designs nuclear propulsion plants for the French navy's nuclear submarines and aircraft carrier. The development of a strong civil industrial base in both countries since the 1950s has produced experienced personnel that bring new ideas from one program to the other. This makes both programs advance faster and become more efficient. It is not unusual for a country to require a foreign vendor to use domestic engineers and local construction assets; however, it must be acknowledged that since the mid-1980s Western companies have trained a large cadre of Chinese engineers in all aspects of the nuclear industry. This will allow Beijing to vastly improve its own capability to develop advanced reactor plants for submarines that are more efficient and reliable than in the past.

The ability of the Chinese to produce large, complex structures for use in nuclear power plants has been vastly improved by the technology and training provided by Western companies. The Qinshan 1

nuclear power plant, though reportedly produced domestically, had many of its major components imported, including the vessel (Japan) and Main Cooling Pumps (Germany).¹¹ Today, China produces many of these large components domestically. The skills and technology needed to produce components such as turbines, steam generators, and pressure vessels for civilian power plants are essential for producing these components for submarines.

The Chinese have also become involved in using the most advanced computer software for plant design. The Qinshan nuclear power plant project extensively used Computer Aided Design and Drafting (CADD) technology provided by AECL.¹² This will significantly improve China's ability to produce complex machinery, such as submarines and ships. The use of these types of programs has been integral to the development of the most advanced class of U.S. submarines.¹³ The agreements that CNNC has signed with AECL and AREVA indicate that this type of software will be used extensively in future design projects, giving the Chinese even more experience with this critical technology.

Instrumentation and Control (I&C) equipment is the most complex part of designing a nuclear reactor. The I&C systems that the Chinese have received from companies such as Siemens, AECL, and AREVA are the most advanced in the world. These can be duplicated and used for many other applications, including on propulsion plants for submarines and other ships. The availability of an I&C system that incorporates the latest technology will significantly increase the reliability of China's future nuclear submarines.

China's Prospective Nuclear Submarine fleet

The development of China's type 093

submarine started sometime in the 1980s or before. Construction of the first unit began in 1994, but it was not launched until 2002. It is speculated to be similar to a Russian *Victor III* using two Pressurized Water Reactors (PWR) and other Russian technologies.¹⁴ However, various sources state that the 093 has an advanced high temperature high efficiency reactor plant.¹⁵ Whatever the case, the use of the technology gained by the civilian nuclear industry has the potential to greatly improve submarines designed and built in China.

The transfer of technology has most likely played a part in providing the 093 and future submarines with advanced I&C equipment, a better-designed reactor fuel cell, and higher quality construction of the reactor plant. This is the minimum that the Chinese would be able to get from the technology that they had obtained by the mid-1990s when the 093 was started. The delays on the ship could very well have been caused by continuous attempts to update the design as construction progressed. The 093 was laid down in 1994,¹⁶ but construction began on the Qinshan 2 nuclear power plant in 1996 (with French assistance), Qinshan 3 in 1998¹⁷ (Canadian), and Ling Ao in 1995 (French). The Yinbin Fuel Plant was upgraded by the French in 1994,¹⁸ and from 1994 to 1996, Westinghouse made the plans for the AP600 (its most advanced civilian nuclear power plant) available for the Chinese to study.¹⁹ Thus, the nuclear technology flowing into China during the period from 1994 to 2002 was – by any measure – very substantial. The Chinese may have made the decision early on to delay the 093 in order to incorporate the maximum amount of foreign nuclear technology possible.

Given the technology transfer described above, it is at least possible that China has developed a submarine-compatible high

temperature gas-cooled reactor (HTGR). This possibility is worth considering for several reasons. The first is that, if successful, a HTGR would allow for a much lighter power plant. A HTGR is twice as efficient as a PWR so it would require a substantially smaller core for the same power output. It is also cooled by helium at a relatively low pressure instead of by high-pressure water. This reduces the weight not only of the coolant but also of the piping. The reduced weight would potentially allow the submarine to be faster and smaller.

The second reason is that the Chinese have stated that their goal in designing weapons is to use the latest technology to leap ahead. Developing a unique reactor system would be a dramatic example of this policy. The research on HTGR in China started in the 1970s,²⁰ before a substantial amount of development in the civilian nuclear power industry began; this tends to indicate that some type of military use was envisioned. This would also help to explain why it has taken so long to build the 093. The conventional theory that the 093 is similar to a *Victor III* design, and that the Russians assisted in its construction, by contrast, would predict rather rapid development. This, however, has not occurred, suggesting at least the possibility that there is something significantly different about this submarine.

The technical difficulties that would have to be overcome with the blowers (i.e. the need for magnetic bearings) and the fuel loading system to make a HTGR compatible with a submarine are formidable. This makes the probability of the 093 being equipped with a HTGR small. Nevertheless, it should be taken into consideration that if not the 093, then a future Chinese submarine could have a reactor of this type. Such a vessel could take a form that would represent a significant departure from current nuclear submarines that are designed for open ocean long endurance operations.

Chinese strategy for the near and medium term appears to be focused on pushing its defenses out to the first island chain, which includes Japan, Taiwan, and the Philippines. This will require more shallow water access denial platforms, instead of long-range open ocean submarines. A small submarine, similar to a diesel electric submarine but equipped with a small

HTGR to recharge the batteries, would be an ideal sea denial platform. It could stay submerged for extended periods of time while lying in wait for a passing ship. This submarine could have technology currently available from the recently purchased *Kilo*-class submarines for the batteries and propulsion while using a reactor on the scale of the HTR 10 (2500 KW generator). The reactor would have to be quiet, but a HTGR equipped with an integral gas turbine/blower outfitted with magnetic bearings could – in fact – be designed to be very quiet.

Conclusion

We would be foolish to dismiss China's ability to develop complex weaponry. The 091 submarine is often cited as an example of Chinese engineering incompetence, since the submarine is viewed as one of the worst in the world. But when considered in the context of when it was built and the state of the Chinese economy and political system at that time, it is actually impressive that the submarine was ever finished. No one denies that the Chinese economy and industrial base have made extraordinary strides since that time and that the level of technical expertise in China has risen dramatically. Combine this with the advanced technology currently available to China, and it seems evident that the 093 submarine is unlikely to be a simple copy of a 1970s vintage Russian design, but rather something significantly more advanced.

The use of nuclear power is vital to the Chinese economy and to helping reduce its dependence on coal and imported oil, while also reducing its emissions of greenhouse gasses. The United States is facing the same issues and is also turning back to nuclear power again. A major concern is how much technology should be given to China to make its nuclear energy industry safer. The United States does not want China to have a Three Mile Island or Chernobyl-type accident, of course, so it is in Washington's interest to ensure that China has the most advanced technology to operate its nuclear power plants safely. Moreover, there are obviously strong commercial incentives to feed China's nuclear power appetite. However, the United States has a legitimate concern with the extent to which those technologies can be transferred to military applications. Of course, this same dilemma is present in all

technology transfers, but few other industries have such direct links between civil and military programs. U.S. naval analysts should be concerned, lest such transfers aid China in developing a robust nuclear submarine fleet that could unhinge the delicate balance of security and stability in the Asia-Pacific region.

Master Chief Petty Officer (SS/AW) Shawn Cappellano-Sarver enlisted in the Navy in January 1981. He has served on USS *George Washington* Carver (SSBN-656) and USS *Memphis* (SSN-691) among others. In 2005 he was selected as one of the first four command master chiefs to ever attend the Naval War College, graduating in March 2006 with a Master of Arts in strategic studies and national defense. He is currently serving as a command master chief in Carrier Air Wing FIVE, Naval Air Facility Atsugi, Japan.

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Images courtesy of Friends of The Hunley



(above) A computer rendering of H.L. Hunley

(right) Horace Lawson (H.L.) Hunley, inventor and builder of Hunley.



The Birth of Undersea Warfare — H.L. Hunley

On April 19, 1861 – just days after the fall of Fort Sumter and the beginning of the American Civil War – President Abraham Lincoln ordered a naval blockade of all major southern ports in an effort to cut off Confederate weapons and supplies. Home to not only Fort Sumter but also the largest port in the south, Charleston, S.C. soon became the focus of the Union blockade, and the naval war itself. Nearly three years later, the blockade continued to maintain a near stranglehold on the city. The Confederates still held the city itself, but the situation was becoming dire as fewer and fewer supply ships broke through the massed Union forces.

It was in these desperate times that a steam-gauge manufacturer from New Orleans and a lawyer from Tennessee named Horace Lawson Hunley would join forces to support the South, and ultimately aid the beleaguered people of Charleston. Betting on technical ingenuity and sheer determination, these men led an effort to design, build, and send into battle what became the first submarine to sink a ship in wartime. Suffering many losses – including Hunley himself, for whom the vessel was later named – the success of the H.L. Hunley garnered great attention from both Union and Confederate commanders. Although it was not an American Navy's first submarine, Hunley was the first to indisputably prove the concept of undersea warfare, thus inspiring future generations of shipbuilders and redefining naval strategy forever.

With the Union's blockading ships not only cutting off Southern supplies but also occasionally bombarding port cities all along the coast, the Confederate authorities were desperate for a means to strike back at the U.S. Navy's dominating presence. They deployed explosive "torpedoes" – which today would be called mines – in many harbors to keep the ironclads and other enemy vessels at bay. However, what was really needed was some means to increase the success of their blockade runners. For that purpose, they endeavored to build a series of novel attack craft that could use torpedoes offensively and attack the blockade ships unseen.

Within the Confederacy, a spirit of both nationalism and the hope of financial gain fostered great interest in submersible design and construction in southern coastal cities, especially when high bounties were offered for sinking ships of the blockade. Unbridled by the inherent bureaucratic delays of U.S. Navy contracting, the Confederates encouraged a growing number of southern profiteers and ultimately enlisted approximately 50 for the Confederate cause.¹ One of these men was James McClintock, who – with business partner Baxter Watson – had already sold the South two machines for making bullets. In closing their first deal to supply a combat submersible, they established the core design and engineering team that would, using trial and error, build a series of vessels that eventually culminated in the successful *Hunley*.²

Early Predecessors: *Pioneer* and *American Diver*

The first of a series of submarines designed and built by McClintock and Watson began construction late in 1861 in New Orleans. Fabricated from quarter-inch iron plates, *Pioneer* was 30 feet long and four feet in diameter, with dive planes and a propeller at one end powered by two crewmen working a hand crank. Although McClintock himself later admitted that the overall configuration was faulty, the submarine reportedly sank a schooner and two target barges during sea trials by means of towed torpedoes. Despite its purported successes, *Pioneer* never saw battle

because of the untimely fall of New Orleans to Union forces under Capt. David G. Farragut and General Benjamin F. Butler in late April 1862. McClintock and his team were forced to scuttle the vessel in Lake Ponchartrain and flee to Mobile, Ala. *Pioneer* was later recovered and studied by the Union, and in 1868 it was sold for scrap at a public auction. Nonetheless, their successes with *Pioneer* – and their narrow escape from New Orleans – drove these men to make a second attempt at perfecting their craft.³

It was early in the construction of *Pioneer* that Horace Hunley joined McClintock and Watson in their efforts, ultimately providing significant financial backing for the craft and several others they would build together. Although he had already been a state legislator, customs collector, and southern planter, it would be for his role as a submarine pioneer that Hunley would be remembered.

In Mobile, McClintock and his team were quick to find new business partners in the wake of the loss of *Pioneer*. In Thomas Park and Thomas Lyons, who owned the Park & Lyons machine shop, McClintock found both new support and a venue to build his second undersea vessel, the *American Diver*.

Having learned much in building *Pioneer*, McClintock pursued new ideas – and faced some old challenges – in his second effort. After the war had ended, he noted these thoughts about the design of *American Diver*.

“To obtain room for the machinery and persons, she was built 36 feet long, three feet wide, and four feet high; 12 feet at each end was built tapering or modeled to make her easy to pass through the water. There was much time and money loss in efforts to build an electromagnetic engine for propelling the boat... I afterwards fitted cranks to turn the propeller by hand, working four men at a time, but the air being so closed, and the work so hard, that we were unable to get a speed sufficient to make the boat of service against vessels blockading the port.”⁴

Little is known of McClintock's electromagnetic engine beyond the fact that he eventually abandoned the idea, but it reveals the magnitude of his technical creativity in addressing the challenges

of underwater propulsion. He and his team had also made a similarly abortive effort to use a small, custom-built steam engine to propel *American Diver* before finally returning to human labor. Just as with *Pioneer*, *American Diver* was fabricated from quarter-inch iron. Its sides were squared off, in contrast to the first vessel, and it had a 30-inch propeller in the stern.⁵

In February of 1863, *American Diver* was taken in tow for Fort Morgan, at the mouth of Mobile Bay, with the intention of attacking the blockading ships. Unfortunately, foul weather set in during the transit, and *Diver* was swamped. It was ultimately cut free and allowed to sink for fear of taking its towing ship down with it. No lives were lost, but to this day *American Diver* still sits somewhere on the sea floor where it went down.

The Union Takes Notice

By this stage in the war, the South had attempted to deploy three general classes of offensive platforms – essentially torpedo delivery vessels. In addition to slightly modified traditional surface craft, there were also a number of steam-powered semi-submersible vessels known as “David” boats. In October, 1863, a David successfully attacked USS *New Ironsides*, a blockading ironclad, drawing significant attention from Union flag officers. Just as concerns were growing over the appearance of these Davids, Union officers also began receiving reports of the third type of torpedo craft, and news of this hand-powered, fully submersible vessel – a David that could dive – had them even more uneasy.⁶

Rear Adm. John Dahlgren, commander of the South Atlantic Blockading Squadron, in reporting back to Gideon Welles, Secretary of the Navy, wrote of these events.

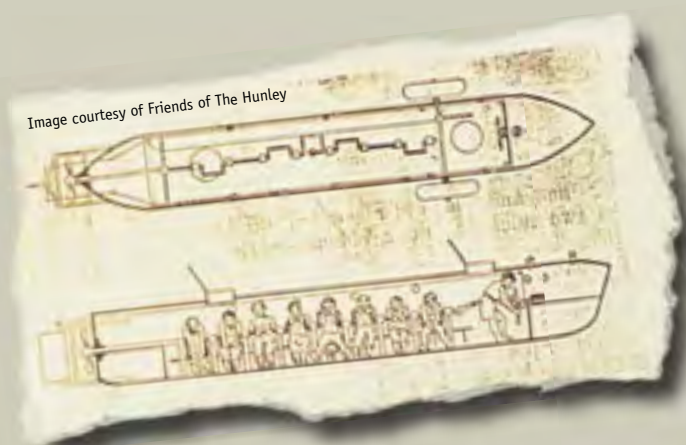
“The action of the ‘Davids’ has been, of course, pretty well exemplified on the Ironsides; that of the ‘Diver’ is different, as it is intended to submerge completely, get under the bottom, attach the torpedo, haul off, and pull trigger. So far the trials have been unlucky... Still she does dive, as one of the deserters saw her pass twice under the bottom of a vessel he was in and once under the Charleston. ... On receiving this intelligence I caused additional means of prevention to be used, as will be seen by copies of enclosed orders, and the Department may be assured that if any of our monitors are injured it will not be for lack of the utmost vigilance.”⁷

Clearly the admiral was wary. To add to the protection of his vessels, underwater nets were deployed, and steam tugs, scout boats, and cutters were used as pickets in advance of and around the blockading ships.

Apparently, the “Diver” in Admiral Dahlgren's report was actually *H.L. Hunley* – McClintock's third submarine – which had been observed conducting trials prior to her fateful mission.

More Lessons at Great Expense

Despite McClintock and Watson's growing proficiency in designing and building submarines, this third craft had engineering flaws that would cause a series of tragedies of its own. Because of financial difficulties caused by loss of *American Diver*, McClintock joined with the Singer Submarine Corps, a group of



Two views of *H.L. Hunley* drawn from a description by Charles Hasker, a survivor of an early sinking.

A computer rendering of
H.L. Hunley and sinking USS
Housatonic.



Images courtesy of Friends of The Hunley

engineers from Mobile with close ties to the Confederate Secret Service, for additional support and funding.

McClintock fashioned his third vessel from a 3/8-inch iron steam boiler which he and the Singer team lengthened and deepened to fit a crew of nine.⁸ The ship was 40 feet long, 42 inches wide in the middle, 48 inches high, and once again, it was designed to be powered by the crew working internal cranks attached to the propeller.⁸

Before it was named the *H.L. Hunley*, the new boat had been known by a number of other names such as “Fish Boat” and “Fish Torpedo Boat,” and it was launched at Mobile in July 1863. It took little time to prove her effectiveness. In a staged demonstration for a group of senior officers, the *Hunley* successfully submerged and towed a torpedo under a derelict barge and destroyed it with a resounding detonation. Within days of this successful test in August 1863, the vessel was pulled from the water and shipped via flatcar to South Carolina. Charleston was facing renewed attacks, and there was renewed urgency in deploying the submarine.

While McClintock was still building *American Diver*, the Confederate Army had provided support in the person of one Lt. William Alexander. Then, when *H.L. Hunley* moved into development, another soldier, Lt. George Dixon, joined the effort. However, soon after her arrival in Charleston, the submarine was seized by the Confederate authorities out of their frustration with McClintock in delaying the application of the boat to address the pressing crisis at hand.

Newly crewed by Confederate Navy personnel, *H.L. Hunley* was rushed into preparations for making an attack. This reckless haste soon led to tragedy as two successive crews sank with the boat to the bottom, losing most of the men involved and nearly undermining the entire mission in Charleston. The first disaster took five of the nine crew members, but one that escaped was able to describe the actions of his skipper, Lt. John Payne.

*“Lieutenant Payne, who had charge, got fouled in the man-hole by the hawser and in trying to clear himself got his foot on the lever which controlled the fins. He had just previously given the order to go ahead. The boat made a dive with the manholes open and filled rapidly. Payne got out of the forward hole and two others out of the aft hole. Six of us went down with the boat. I had to get over the bar which connected the fins and through the column of water which was rapidly filling the boat. The manhole cover came down on my back; but I worked my way out...”*⁹

Similarly, the entire second crew was lost in submerging for reasons not fully understood, but likely involving a partially open hatch. Sadly, on this occasion, the *Hunley*'s chief financier, Horace Hunley, had chosen to conn the vessel himself in the absence of her customary commanding officer, Lt. Dixon, and he was drowned as well. General P.G.T. Beauregard later recorded the events.

“Lieutenant Dixon made repeated descents in the harbor of Charleston, diving under the naval receiving ship which lay at anchor there. But one day when he was absent from the city Mr. Hunley, unfortunately, wishing to handle the boat himself, made the attempt. It was readily submerged, but did not rise again to the surface, and all on board perished from asphyxiation. When the boat was discovered, raised and opened, the spectacle was indescribable and ghastly; the unfortunate men were contorted into all kinds of horrible attitudes...”

“After this tragedy I refused to permit the boat to be used again; but Lieutenant Dixon, a brave and determined man,



Civil War reenactors deliver a final rifle salute during the funeral of *H.L. Hunley*'s crew at Magnolia Cemetery, Charleston, S.C. on April 17, 2004.

having returned to Charleston, applied to me for authority to use it against the Federal steam sloop-of-war Housatonic, a powerful new vessel, carrying eleven guns of the largest caliber, which lay at the time in the north channel opposite Beach Inlet, materially obstructing the passage of our blockade runners in and out.”¹⁰

Despite the tragic loss, Horace Hunley will forever be commemorated by his namesake ship. With the *Housatonic* presenting a target of opportunity, however, Dixon would also ensure that Hunley and the other crewmen had not died in vain.

The Mission

In large part due to Lt. Dixon's continuing determination and his belief in his ability to operate the vessel effectively, *H.L. Hunley* was salvaged a second time and loosed on its mission against *Housatonic*. Because so many of the in-shore ironclads had deployed additional force protection measures against the Confederate David boats, the *Housatonic* presented itself as an ideal target. Not only was it strategically situated to obstruct blockade runners outside the harbor's mouth, it was also anchored in deeper water, and did not have the same protection as many of the ironclads.

On February 17, 1864, Lt. Dixon and his crew set out to attack their prey. *Housatonic* lay at anchor approximately two and a half miles offshore. Although a lookout eventually detected the approaching *Hunley*, it was too late in raising the alarm. The submarine rammed the ship with a spar torpedo affixed to her bow, planting a 135-pound explosive charge against the warship. As the submarine quickly backed away, Union bullets pelted the hull, but the 150-foot rope used to detonate the charge drew taut and detonated the charge, tearing an enormous hole in the *Housatonic*'s side. She went down within three minutes.

Only five crewmen were lost on *Housatonic*, with many others escaping to the nearby USS *Canandaigua*. It was from that refuge that the *Housatonic*'s executive officer, Lt. F.J. Higginson, reported

the event the following day.

“At about 8:45 p.m. the officer of the deck... discovered something in the water about 100 yards from the moving ship. It had the appearance of a plank moving in the water. It came directly toward the ship, the time from when it was first seen till it was close alongside being about two minutes. During this time the chain was slipped, engine backed, and all hands were called to quarters. The torpedo struck the ship forward of the mizzenmast, on the starboard side, in a line with the magazine. Having the after pivot gun pivoted to port we were unable to bring a gun to bear upon her. About one minute after she was close alongside the explosion took place, the ship sinking stern first and heeling to port as she sank.”¹¹

Unfortunately, *H.L. Hunley* never returned from her successful mission. Although most believed that she succumbed to the explosion of her own torpedo, it is now believed that the submarine escaped the encounter safely, but went down soon after for other reasons. An agreed-upon signal – a blue light from the submersible – had been planned to indicate that the boat was on its way back to base. This light was seen from the shore following the explosion, but nonetheless, the *Hunley* never returned. While very recent findings suggest an unsecured hatch door may ultimately have doomed the vessel, it is likely we will never know for sure. What is certain, however, was the effect that Hunley's success had on the Union blockading forces. Admiral Dahlgren's report of the incident to the Navy Secretary Gideon Welles reflects the approach of a new era – one in which undersea warfare would play a key role.

“Sir: I much regret to inform the Department that the U.S.S. Housatonic, on the blockade off Charleston, SC, was torpedoed by a rebel ‘David’ and sunk on the night of the 17th February

about 9 o'clock... The Department will readily perceive the consequences likely to result from this event; the whole line of blockade will be infested with these cheap, convenient, and formidable defenses, and we much guard every point. The measures for prevention may not be so obvious. I am inclined to the belief that in addition to the various devices keeping the torpedoes from the vessels, an effectual preventive may be found in the use of similar contrivances... I desire to suggest to the Department the policy of offering a large reward of prize money for the capture or destruction of a 'David;' I should say not less than \$20,000 or \$30,000 for each. They are worth more than that to us."¹²

Conclusion

The *Hunley's* successful mission was a key precursor for the evolution of the submarine into the potent weapon it has become today. Even McClintock, writing years later about his undersea endeavors, saw the great potential of his creation.

*"The boat and machinery was so very simple, that many persons at first inspection believed that they could work... without practice... and although I endeavored to prevent inexperienced persons from going under water... I was not always successful... Since the war, I have thought over the subject considerable, and am satisfied that the Power can easily be obtained... to make the submarine Boat the most formidable enemy of Marine warfare ever known."*¹³

Reflections on *Hunley's* significance to the modern submarine has continued over the years. One of the more poignant was in 1958 when Rear Adm. Fredrick B. Warder, then Commander, Submarine Forces, Atlantic Fleet, shared his thoughts on *Hunley's* legacy.

*"We in submarines owe Hunley a great deal, but the fact this crude vessel was the forerunner of present undersea warfare isn't the only important aspect of the 19th century boat. The Hunley was the first submarine to ever sink a warship in combat... This little boat taught men a great deal by her short and tragic adventure. True, her imperfections were many and her success in combat scant and fatal, but she set a precedent of world shaking consequence. By sinking that Union ship, Hunley demonstrated that a ship could veil herself in the underwater world and, through the element of surprise, deal an enemy a deadly blow. This was the beginning of a drastic change – a brilliant revolution – in sea warfare."*¹⁴

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Footnotes

The author is greatly indebted to the wealth of primary source information on the *Hunley* made available on the Naval Historical Center website, and especially *The H.L. Hunley in Historical Context* by Rich Wills, former Assistant Underwater Archaeologist, also found at this site. Another excellent source of information on *Hunley* is *Union and Confederate Submarine Warfare in the Civil War* by Mark Ragan.

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Image courtesy of Friends of the Hunley

H.L. Hunley was discovered on May 3, 1995. This photo shows her during the recovery process in August 2000.



Changes of Command

Submarine Group SEVEN
Rear Adm. Douglas McAneny relieved
Read Adm. John Bird

Naval Weapons Station Charleston
Capt. Robert Brennan relieved
Capt. Gary Edwards

USS Chicago (SSN-721)
Cmdr. Rick Stoner relieved
Cmdr. Richard Wortman

USS Tennessee (SSBN-734)(G)
Cmdr. Rhett Jaehn relieved
Cmdr. Dean Nilsen

USS San Juan (SSN-751)
Cmdr. Michael W. Martin relieved
Cmdr. Harvey Guffey Jr.

USS Pasadena (SSN-752)
Cmdr. Douglas Perry relieved
Cmdr. JP Heatherington

USS Scranton (SSN-756)
Cmdr. Wesley Guinn relieved
Cmdr. Michael Quinn

USS Hartford (SSN-768)
Cmdr. Ryan K. Brookhart relieved
Cmdr. Frank Cattani

USS Tuscon (SSN-770)
Cmdr. Paul Spear relieved
Cmdr. James Pitts

USS Cheyenne (SSN-773)
Cmdr. Mike Tesar relieved
Cmdr. Richard Testyon Jr.

USS Texas (SSN-775)
Cmdr. James L. Gray relieved
Capt. John Litherland

Qualified for Command

Lt. Cmdr. Jefferey Bierley
SUBDEVRON-12

Lt. Cmdr. Matthew Boland
USS Hampton (SSN-767)

Lt. Cmdr. Steven Brabec
USS Providence (SSN-719)

Lt. Cmdr. John Craddock
SUBRON-4

Lt. Cmdr. Robert Haldeman
SUBRON-4

Lt. Cmdr. Dennis Johnson
USS Scranton (SSN-756)

Lt. Cmdr. Michael Majewski
USS Newport News (SSN-750)

Lt. Cmdr. James O'Harrach
SUBRON-4

Lt. Cmdr. Jason Wartell
SUBRON-4

Unrestricted Line Officer Qualified in Submarines

Lt. Gregory Allen
USS Virginia (SSN-774)

Lt. Ryan Dropek
USS Seawolf (SSN-21)

Lt. Matthew Sweeney
USS Jacksonville (SSN-699)

Lt. Luke Vriezen
USS Virginia (SSN-774)

Lt. Andrew Waldmann
USS Virginia (SSN-774)

Lt. j.g. Lucas Adin
USS Virginia (SSN-774)

Lt. j.g. Antonio Alarcon
USS Wyoming (SSBN-742)(G)

Lt. j.g. Thomas Belchik
USS Maryland (SSBN-738)(B)

Lt. j.g. Samuel Bell
USS Hyman G. Rickover (SSN-709)

Lt. j.g. Rodolfo Benitez
USS West Virginia (SSBN-736)(G)

Lt. j.g. Christopher Bernotavicius
USS Virginia (SSN-774)

Lt. j.g. Bryan Blackburn
USS Springfield (SSN-761)

Lt. j.g. Christopher Blais
USS Seawolf (SSN-21)

Lt. j.g. David Bloom
USS Hyman G. Rickover (SSN-709)

Lt. j.g. Daniel Brammer
USS Wyoming (SSBN-742)(G)

Lt. j.g. Kenneth Byers
USS Georgia (SSGN-729)

Lt. j.g. Zach Conley
USS Connecticut (SSN-22)

Lt. j.g. Michael Engelbert
USS San Juan (SSN-751)

Lt. j.g. Nathaniel Ferrer
USS Dallas (SSN-700)

Lt. j.g. Joseph Fontenot
USS Augusta (SSN-710)

Lt. j.g. David Garmon
USS San Juan (SSN-751)

Lt. j.g. Jeremy Grouette
USS Norfolk (SSN-714)

Lt. j.g. David Hart
USS Minneapolis-St. Paul (SSN-708)

Lt. j.g. Jasen Hicks
USS Georgia (SSGN-729)

Lt. j.g. Todd Jennings
USS Maryland (SSBN-738)(B)

Lt. j.g. Philip Keith
USS Virginia (SSN-774)

Lt. j.g. Michael Lutes
USS Maryland (SSBN-738)(B)

Lt. j.g. Daniel Manteufel
USS San Juan (SSN-751)

Lt. j.g. Aaron Martin
USS Albuquerque (SSN-706)

Lt. j.g. James McClure
USS West Virginia (SSBN-736)(G)

Lt. j.g. Carter McCrary
USS Norfolk (SSN-714)

Lt. j.g. Daniel McNab
USS Boise (SSN-764)

Lt. Andrew Mierisch
USS Dallas (SSN-700)

Lt. j.g. Christopher Miles
USS Philadelphia (SSN-690)

Lt. j.g. Robert Montgomery
USS Rhode Island (SSBN-740)(B)

Lt. j.g. Andrew Murray
USS Toledo (SSN-769)

Lt. j.g. Alexander Nusraty
USS Seawolf (SSN-21)

Lt. j.g. Matthew Osburn
USS Tennessee (SSBN-734)(G)

Lt. j.g. Carlos Otero
USS Jacksonville (SSN-699)

Lt. j.g. Lewis Patterson
USS Alexandria (SSN-757)

Lt. j.g. George Perry
USS Toledo (SSN-769)

Lt. j.g. Randolph Reed
USS Virginia (SSN-774)

Lt. j.g. Mark Rogge
USS Toledo (SSN-769)

Lt. j.g. John Schafer
USS Miami (SSN-755)

Lt. j.g. Glenn Schatz
USS Georgia (SSGN-729)

Lt. j.g. Tommy Seifert
USS Rhode Island (SSBN-740)(B)

Lt. j.g. Dustin Springer
USS West Virginia (SSBN-736)(G)

Lt. j.g. Thomas Struble
USS Virginia (SSN-774)

Lt. j.g. Richard Taiclet
USS Virginia (SSN-774)

Lt. j.g. Edgardo Torres
USS West Virginia (SSBN-736)(G)

Lt. j.g. David Tranotti
USS Toledo (SSN-769)

Lt. j.g. Thomas Wall
USS Springfield (SSN-761)

Lt. j.g. Fredrick White
USS Hartford (SSN-768)

Lt. j.g. Anthony Wilson
USS Florida (SSGN-728)

Limited Duty Officer Qualified in Submarines

Lt. Keith Burdick
USS Toledo (SSN-769)

Lt. Edward Casas
USS Rhode Island (SSBN-740)(B)

Ens. Sammie Green
USS Emory S. Land (AS-39)

Ens. Henry Gudino
USS Emory S. Land (AS-39)

Chief Warrant Officer
2 Rodney Norwood
USS Emory S. Land (AS-39)

Supply Corps Officer Qualified in Submarines

Lt. Paul Carey
USS Wyoming (SSBN-742)(G)

Lt. Michael Johnson
USS Hampton (SSN-767)

Lt. j.g. Jason Miller
USS Kentucky (SSBN-737)(G)

Lt. j.g. Eric Underwood
USS Wyoming (SSBN-742)(G)

Ens. Konrad Krupa
USS Annapolis (SSN-760)

Medical Officer Qualified in Surface Warfare

Lt. Michael Fraser
USS Emory S. Land (AS-39)

Other

Naval Undersea Warfare Center
Rear Adm. John Elnitsky relieved
Rear Adm. Stephen Johnson

Undersea Warfare Directorate (SEA 07)
Rear Adm. (Sel.) Thomas Eccles relieved
Rear Adm. William Timme



Other Continued

SOF Undersea Mobility Program Office (PMS 399)
Capt. Jerry Burroughs relieved
Rear Adm. John Elnitsky

Undersea Defensive Warfare Systems Program Office (PMS 415)
Capt. Brian Vance relieved
Capt. Mark Bock

Submarine Acoustics Program Office (PMS 401)
Capt. Rick Nicklas relieved
Capt. Gib Kerr

SSGN Program Office (PMS 398)
Capt. Mark Bock relieved
Capt. David Norris

Q&A: The U.S. Submarine Force From the Perspective of Midshipmen

continued from page 21

that there is a job to be done and you may have to take orders from your friend. You can't ignore an order just because the guy giving that order is your friend.

Midn. 1st Class Evans: The curriculum has given us a great background to bring to the boat. From our core classes to specialized propulsion classes, we're getting the tools necessary to succeed on that boat.

Q: How do you see the roles and missions of the Submarine Force evolving by the time you hit the CO pipeline?

Midn. 1st Class Evans: I think one of the most interesting options we'll have is the SSGN platform. It is really going to open up the types of missions that the Submarine Force can carry out. I also see the surveillance and special operations roles growing in the future.

Midn. 1st Class Osyf: I really like the *Virginia*-class platform because of the varied types of missions it can carry out. I'm a political science major, and a lot of our time has been devoted to the study of China and the potential threats they pose. With our newer platforms like the *Virginia*-class and the *Seawolf*-class, we'll have lots of options to confront that – and other – potential threats.

Mr. Smith is the Managing Editor of UNDERSEA WARFARE Magazine and an analyst with Alion Science and Technology in Washington, D.C.

Commander, U.S. Pacific Fleet, Adm. Gary Roughead, left, and Commander, Submarine Force, U.S. Pacific Fleet, Rear Adm. Joe Walsh, center, presented the Arleigh Burke Fleet Trophy to the crew of USS *Columbia* (SSN-771).



Photo by Petty Officer 1st Class Cynthia Clark

Arleigh Burke Trophy Presented To USS *Columbia*

by Petty Officer 1st Class (SW) Cynthia Clark

Pacific Fleet commander Adm. Gary Roughead presented the Arleigh Burke Fleet Trophy to USS *Columbia* (SSN-771) on Aug. 15, formally recognizing the Pearl Harbor-based submarine for being the most improved operational unit in the Pacific Fleet.

Roughead credited the submarine's crew for their hard work and dedication to continuous improvement.

"It was just the way the crew came together and committed itself to doing the right things, a commitment to one another," Roughead said, "and all of that is based on a foundation of character and on always being true to your job, to your shipmates and to yourself."

The trophy is presented each year to the ship or aviation squadron, in both the Atlantic and Pacific fleets, that has achieved the greatest improvement during the preceding year. Among the factors considered are operational accomplishments, performance in inspections, awards and retention.

After completing a shipyard maintenance availability early last year, *Columbia* completed its fleet Response Plan requirements, normally an 18-month process, in just eight months. During that time, the submarine trained prospective commanding officers as part of the Submarine Command Course, shot numerous exercise weapons, and conducted sound trial operations at the Southeast Alaska Acoustic Measurement Facility.

The ship deployed from Pearl Harbor in September 2005, 45 days earlier than originally planned. During its six months in the Western Pacific, *Columbia* participated in multinational exercises with the Royal Australian Navy, made visits to Singapore, Guam, Australia, Japan and Korea, and completed an operation of great importance to national security. The ship was awarded a Meritorious Unit Commendation for that deployment.

"This shows their dedication, expertise and their commitment to meeting the operational schedule," said Cmdr. Gene Sievers, *Columbia's* commanding officer. "I'm extremely proud of those guys. They've done everything we've asked of them."

The Arleigh Burke Fleet Trophy is named in honor of Adm. Arleigh Burke, who served 42 years in the Navy, including six years as Chief of Naval Operations (CNO), the youngest and longest serving CNO in American history.

Anti-Torpedo Defense: Defeating a Ubiquitous Threat to Naval Superiority

continued from page 13

> SLQ-25A soft-kill upgrades to augment the Target Detection System and an improved littoral tow for deployment in shallower operating environments.

Demonstrating the Promise

In late March/early April 2006, the Navy showed the art of the possible in advanced DCL capabilities. With the USS *Cleveland* (LPD-7) serving as test platform, the Navy and a team headed by Ultra Electronics Ocean Systems (a U.S. subsidiary of the British firm, Ultra Electronics, which cooperatively develops torpedo defense systems for the U.S. Navy and the Royal Navy) demonstrated capabilities far in excess of what was expected at this stage in the system's development.

"They were asked to look at salvos of up to two torpedoes," Capt. Mark Bock, then-program manager for Undersea Defensive Warfare Systems in PEO Submarines, commented in a published interview after the tests were completed. However, instead of showing a capability against just two simultaneous torpedoes in salvo, using passive and active sources the Ultra Torpedo Recognition by Active and Passive Reconnaissance (TRAPR) DCL detected, tracked, alerted, and discriminated numerous torpedoes (as many as five launched simultaneously) in six salvos that approached *Cleveland* at various geometries and speeds. At streaming speeds approaching 20 knots, the system detected the threat torpedoes – both electric and thermal-propulsion weapons – at ranges far in excess of what had been previously possible. And it did so with significantly few false alarms – on the order of one in 19 hours in passive mode and 15 false alarms (seven of which occurred together at the same time during a ship-turn into shallow water) in nine hours in active mode.

The Ultra Electronics DCL demonstration team brought a pro-

duction-ready wet-end reeled onto an "E" winch, which is used in the U.K. Surface-Ship Torpedo Defense (SSTD) production system. The "E" winch was specifically designed to handle green water (it is submersible) and fits inside the footprint of the Nixie winch on most U.S. surface ships. The tri-band receive array and the active acoustic sources (flexible towed countermeasure and flexible towed source) were separated by a 300-foot extension cable, and the main tow cable installed was 2,000 feet long. The system was deployed in less than 20 minutes at 20 knots (near maximum speed for *Cleveland*). Inboard the processing and power supplies (power amplifiers for the active tows are integrated into the towed systems) were housed in a portable trials lab for ease of installation and removal. The system allowed for real-time processing of both active and passive DCL and system performance analysis on board, which ensured that Navy observers saw everything and nothing was left to the "magic" of post-processing. The intelligent decision manager embedded in the command and control subsystem drove engineering displays located in the portable trials lab, in *Cleveland's* combat information center and flag plot. This allowed the ship's crew to monitor the system from their normal underway duty stations. The system as deployed not only performed the required DCL functions but had fully integrated the capability to perform all of the SLQ-25A Nixie functions as well.

In sum, the Ultra DCL-1 demonstrated active and passive detection and tracking, easy installation compatibility with existing surface ship towed systems (and the notional possibility for integration of DCL technology into submarine applications, as well), torpedo detection and alerting at tactically significant ranges, minimum false alarms, and highly accurate ATT targeting.

"It was a resounding success," Bock stated. (In May 2006, Bock became program manager of the *Ohio*-class SSGN conversion program.)

The Way Ahead

The torpedo threat to U.S. and coalition naval forces is real and is growing. Tens of thousands of torpedoes – from relatively unsophisticated yet still-deadly weapons to highly complex, leading-edge designs – are in the inventories of navies worldwide. While capable of being launched from surface ships and aircraft, the submarine-launched torpedo poses the gravest danger to mission success. The "detection advantage," i.e. "stealth," enjoyed by the submarine over the surface ship is probably greater today than in 1948. Hence, programs like the DCL are intended to level the playing field.

Vice Admiral Metcalf understood the challenge, even if he did suggest an out-of-the-box solution. Effective torpedo defense: don't leave homeport without it.

Mr. Howard is the Executive Program Manager for AN/WSQ-11 and Vice President of Business Development for Ultra Electronics Ocean Systems Inc. Dr. Truver directs the Center for Security Strategies and Operations in General Dynamics' Information Technology group.

Customs Battalion ROMEO Deploys



Photo by Petty Officer 3rd Class Jason Smith

Reserve Deputy Chief of Staff, Submarine Force, U.S. Atlantic fleet, Rear Adm. (Sel.) John Messerschmidt, thanks the Sailors of Navy Customs Battalion ROMEO as they deploy.



USS Jimmy Carter Gets 'Depermed'

by Chief Petty Officer (AW) Gerald McLain and Chief Petty Officer (SW/AW) Terry L. Rhedin

USS *Jimmy Carter* (SSN-23) underwent a 'deperm' at Naval Base Kitsap Bangor's Magnetic Silencing Facility (MSF) Aug. 16 to minimize its magnetic signature and detection by marine mines.

A vessel slowly acquires its own magnetism from the mechanical stress of being used and constant exposure to the Earth's magnetic field. Deperming, also known as degaussing, is a process to eliminate that magnetism.

"We've done a lot of firsts here," said Cmdr. Dave Honabach, commander of *Jimmy Carter*. "We came out of our first drydock Monday, and this is the first time it's been degaussed."

The Bangor MSF has a drive-in "cage" for conducting deperm or signature measurement events. The cage consists of two cable loops below and around the submarine to generate high intensity vertical and horizontal magnetic fields.

"We had to power down and put away a lot of electronic equipment to do this evolution," said Petty Officer 2nd Class (SS) Nick Oshields, from Greenville, S.C. and a plankowner of *Jimmy Carter*.

Three tugboats and more than 50 linehandlers were on hand to get *Jimmy Carter* into the cage.

"This is my first day here and my chief told me to go over here and help with line handlers," said Seaman Michael Welch of Boca Raton, Fla. "This is neat."

Jimmy Carter, commissioned Feb. 19, 2003, is the third of the

Seawolf-class of attack submarines and is homeported in Bangor, Wash. Its mission is to seek and destroy enemy submarines and surface ships; intelligence collection; special forces delivery; and anti-ship and strike warfare. The *Seawolf*-class is designed to be exceptionally quiet, fast and well-armed with advanced sensors. It is a multi-mission vessel, capable of deploying to forward ocean areas to search out and destroy enemy submarines and surface ships and to fire missiles in support of other forces.



U.S. Navy Photo

MCPON Vists USS Boise



Master Chief Petty Officer of the Navy (MCPON) Joe R. Campa, Jr., speaks to the chief petty officers aboard USS *Boise* (SSN-764), during his first visit to a submarine as MCPON. MCPON spoke about the importance of strong leadership and judging the success of Navy leaders by the accomplishments of the Sailors they lead.

Photo by Mass Communication Specialist 1st Class Brandan Schulze



USS *Tucson* returns from Western Pacific

by Petty Officer 1st Class (SW) Cynthia Clark,
COMSUBPAC Public Affairs

The nuclear-powered attack submarine USS *Tucson* (SSN 770) returned to its home port of Pearl Harbor, Hawaii, from a six-month Western Pacific deployment on Sept. 21.

Since departing Pearl Harbor on March 21, USS *Tucson* visited Sasebo and Yokosuka, Japan, Saipan, and Guam. While in Saipan, *Tucson* crew members joined forces with military veterans and cleaned a World War II bunker. *Tucson* was also in Yokosuka to celebrate the Submarine Force's 106th Birthday at the annual ball, which was attended by numerous U.S. and Japanese Military Self Defense Force officials.

In June *Tucson* participated in Exercise Valiant Shield 2006 near Guam, providing anti-submarine warfare training to three aircraft carrier strike groups. *Tucson* also participated in a bilateral exercise with the Royal Australian Navy submarine HMAS *Farncomb*.

Cmdr. Jimmy Pitts, *Tucson* commanding officer, said his crew played the role of aggressor "superbly," training the carrier strike group in anti-submarine warfare. "The strike group was very capable," he said. "It was a lot of fun."

As for the Australians, Pitts said, "They are very capable submariners. It was a challenge for us and continued to build our friendship with the Australian submarine forces."

"I'm extremely proud of their accomplishments. Each of the guys did a superb job, worked extremely hard and all of America can be proud of them."

Before heading home and spending time with their families, *Tucson* had a few more tasks to do. In addition to re-enlisting one Sailor and pinning dolphins on two officers, they also had a pinning ceremony for the new Chief Petty Officers.

One of the new chief's, Chief Petty Officer(SS) Darin Matrazzo, had his wife Jessica and his two-year-old daughter pin on his anchors. "I'm really proud of him," said Jessica. "I was in the Navy too, it was so great to see him earn this."

Home just in time for his wife to deliver his second daughter, Petty Officer 1st Class(SS) Tim Fredericksen said while it was an honor to do such an important job for his country, it's just as important for him to be home with his family. "This is where it's at," he said.



Also among those with new family members was *Tucson*'s Executive Officer, Lt. Cmdr. Charlie Maher, who's wife, Collette, gave birth to their first daughter Aug. 1st.

"I found out a day later by message," Maher said. "I'm very pleased. She's so beautiful. I'm so lucky."

Tucson has a crew of 18 officers and 118 enlisted men. It displaces more than 6,900 tons, is 360 feet long, and can reach speeds in excess of 25 knots and attain depths of more than 800 feet.

Tucson is one of fifteen nuclear-powered attack submarines homeported at Pearl Harbor.



On The Back

"SSGN" by Nate Ostrow, highlights the unique look of the U.S. Submarine Force's most dynamic platform.

Mr. Ostrow is a Department of Defense Technical Illustrator with extensive experience creating artwork for the Submarine Force and other DoD organizations. His work can be found in the wardrooms and other spaces aboard more than 25 Navy and Coast Guard ships, as well as in the Pentagon, SUBLANT and SUBPAC headquarters, the Bowfin Museum, the Naval Submarine League, and elsewhere. He has also worked as a concept artist for General Dynamics Electric Boat and Marinette Marine Corp.



“SSGN”

Nate Ostrow